United States Department of the Interior
Bureau of Land Management

Winnemucca District
Winnemucca, Nevada

June 1997

Draft Environmental Impact Statement Florida Canyon Mine

Mine Expansion and Comprehensive Reclamation Plan

COOPERATING AGENCIES:

Nevada Department of Conservation and Natural Resources,
Division of Wildlife
U.S. Army Corps of Engineers

BLM MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times.

Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific, and cultural values.

BLM/WN/PL-97/019+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Winnemucca Field Office
5100 East Winnemucca Boulevard
Winnemucca, Nevada 89445
702-623-1500

In Reply Refer To:
1793/3809
(NV-020)

18 June 1997

Dear Reader:

Enclosed is the Draft Environmental Impact Statement (DEIS) for the Mine Expansion and Comprehensive Reclamation Plan proposed by Florida Canyon Mining Inc., prepared by the Bureau of Land Management, Winnemucca Field Office.

The DEIS is based on an amendment to the mine's Plan of Operations submitted to the Bureau under 43 CFR 3809. This DEIS analyzes the direct, indirect and cumulative impacts associated with the continued mining and expansion of the open pit, new or relocated ore processing facilities, overburden disposal areas, exploration for extensions of the ore body, and ancillary facilities. The Proposed Action and the No Action alternatives are analyzed, as well as an alternative configuration for mine facilities. The Plan of Operations and technical reports in support of the plan and DEIS are available for review at this office. Supporting materials referenced in the DEIS (but not the Plan of Operations) are also available for review at the Bureau's Nevada State Office, 850 Harvard Way, Reno, Nevada.

Comments on this DEIS will be accepted until the close of business 18 August 1997. There will be public meetings to take comments on Tuesday 15 July at the Pershing County Community Center, 820 6th St., Lovelock, and Wednesday, 16 July at the Winnemucca Field Office, 5100 E. Winnemucca Blvd., Winnemucca. Both meetings are scheduled for 7-9 PM. Written comments should be directed to Ken Loda, Project NEPA Manager, at the Bureau of Land Management, Winnemucca Field Office, 5100 East Winnemucca Boulevard, Winnemucca, Nevada, 89445.

After the public review and comment period a Final Environmental Impact Statement (FEIS) will be prepared that will consider the comments received. This FEIS may be in an abbreviated format, therefore you should keep this DEIS as a reference. You may direct questions to Ken Loda, Project NEPA Manager, at the above address or phone (702) 623-1500.

Sincerely yours,

Ron Wenker

Ron Wenker
District Manager

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FLORIDA CANYON MINE EXPANSION PROJECT

Lead Agency: U.S. Department of the Interior
Bureau of Land Management
Winnemucca District Office

Project Location: Pershing County, Nevada

Comments on this EIS Should be Directed to: Ken Loda
EIS Project Manager
Bureau of Land Management
Winnemucca Field Office
5100 East Winnemucca Blvd.
Winnemucca, NV 89445
(702) 623-1500

Date Draft EIS Filed with EPA: June 12, 1997

Date by Which Comments Must Be Received by the BLM: August 18, 1997

ABSTRACT

Florida Canyon Mining, Inc. (FCMI) proposes to construct new facilities and expand existing gold mining operations within the Imlay Mining District in Pershing County, Nevada. The mine is located on public and private lands adjacent to Interstate Highway 80 approximately 35 miles northeast of Lovelock and approximately 38 miles southwest of Winnemucca, Nevada. Approximately 860 acres would be disturbed by the proposed mine expansion, of which 447 and 413 acres are public and private lands, respectively. The proposed project would include expansion of the open pit and north and south waste rock dumps, as well as the development of the new south heap leach pad; haul road; solution ponds; solution corridor/road; plant; monitoring wells/road; crusher site; sediment ponds; growth media stockpiles; exploration drill sites and roads; diversion channels; water supply pipelines; and realignment of the Johnson Canyon access road. The anticipated mine life under the Proposed Action would be 5 years.

This draft environmental impact statement analyzes the environmental effects of the Florida Canyon Mine Expansion Project, plus the North Extension of the Heap Leach Pad Alternative and the No Action Alternative.

Responsible Official for EIS: Michael R Holbert acting for
Ron Wenker
District Manager
Winnemucca District

SUMMARY

PROPOSED ACTION

Florida Canyon Mining, Inc. (FCMI) proposes to construct new facilities and expand existing gold mining operations within the Imlay Mining District in Pershing County, Nevada. The mine is located on public and private lands adjacent to Interstate Highway 80 approximately 35 miles northeast of Lovelock and approximately 38 miles southwest of Winnemucca, Nevada. FCMI has been operating the Florida Canyon Mine since 1986. Historical mining in the proposed project vicinity dates back to the 1860s.

A Plan of Operations for the Florida Canyon Mine was submitted to the Bureau of Land Management (BLM) in October 1985 and was approved in February 1986. Construction began in February 1986 with mining beginning in August 1986. Activities within the Florida Canyon Mine operations area have expanded periodically since production began in 1986. To date, approximately 1,259 acres have been disturbed.

Current mine facilities consist of a series of connected pits, waste rock dump areas, a heap leach pad and associated processing plant, access and haul roads, and ancillary facilities. An additional 860 acres would be disturbed by the proposed mine expansion, of which 447 and 413 acres are public and private lands, respectively. The proposed project would include expansion of the open pit and north and south waste rock dumps, as well as the development of the new south leach pad; haul road; solution ponds; solution corridor/road; plant; monitoring wells/road; crusher site; sediment ponds; growth media stockpiles; exploration drill sites and roads; diversion channels; water supply pipelines; and realignment of the Johnson Canyon access road. The anticipated mine life under the Proposed Action would be 5 years.

The proposed project would provide for a construction phase of approximately 12 months, scheduled to begin in September 1997. Operations would continue for 5 years, through 2002. Reclamation would continue until 2010, with monitoring continuing for several years following reclamation. No increases in operations personnel are anticipated. An average construction work force of 43 would be employed over the 12-month construction phase, with a peak of 104 workers employed for a 2-month period approximately half way through the construction phase.

ALTERNATIVES

The Environmental Impact Statement (EIS) analyzes the direct, indirect, cumulative, and residual environmental impacts of the Proposed Action, the North Extension of the Heap Leach Pad Alternative, and the No Action Alternative. The alternatives are described in the following sections.

North Extension of the Heap Leach Pad Alternative

The North Extension of the Heap Leach Pad Alternative would expand the existing heap leach pad to the north rather than construct a new heap leach pad to the south, and would result in approximately 717 acres of total project surface disturbance. The heap leach pad extension would disturb approximately 156 acres. The existing North and South Waste Rock Dumps would be expanded by approximately 92 and 248 acres, respectively.

No Action Alternative

Under the No Action Alternative, currently permitted operations (Amendment No. 8) at the Florida Canyon Mine would cease after 1997. Mineral resources in this area would remain undeveloped, and no expansion or construction of the mine pit, waste rock dumps, heap leach pads, or other ancillary facilities would occur.

IMPORTANT ISSUES AND IMPACT CONCLUSIONS

A small number of issues were raised during scoping for this EIS. Additional issues were identified by resource specialists during the preparation of the EIS. These issues along with their impact conclusions are presented below. Impact conclusions include the implementation of mitigation measures that have been identified. These measures are presented in detail in Chapter 3.0 of this EIS for each affected resource.

Geology and Minerals

Issue: Construction in an area where the facility could potentially be affected by, or induce, geologic hazards.

Conclusion: The activities at the proposed site are not expected to generate any geologic hazards, nor should the proposed facility be affected by such hazards. Although the region has a history of seismic activity, the project site has been seismicly inactive for recorded history based on records available at the National Earthquake Center, located in Golden, Colorado.

Issue: Interference with the present or future development of other known mineral resources.

Conclusion: Condemnation drilling has been completed in order to minimize the possibility of covering any future economic ore deposits. The only known potential geologic or mineral resource to be affected is the covering of the alluvium, which is economically insignificant.

Water Resources and Geochemistry

Issue: Degradation of surface water quality based on Nevada or Environmental Protection Agency water quality standards for appropriate or designated beneficial uses.

Conclusion: Perennial streams and springs do not exist within the project area, so no impacts to perennial streams or springs are expected. Ephemeral drainages exist within the project area and carry water only during seasonal snowmelt or heavy precipitation events.

Issue: Degradation of groundwater quality based on Nevada drinking water standards.

Conclusion: Geochemical testing indicates that waste rock from the mine does not have a potential to generate acid seepage. Column tests indicate that water in contact with backfill material would be of similar quality to existing groundwater.

Issue: Reduction of static water levels (5 feet or greater) in existing wells because of pit dewatering.

Conclusion: A groundwater model was run to predict the drawdown at the end of mining and the maximum horizontal extent of drawdown as defined by the 5-foot drawdown contour. The results indicate that drawdown effects would not extend beyond the proposed permit boundaries to the north and west and would not impact wells located northwest of the project area.

Issue: Measurable reduction in flow of perennial streams or springs.

Conclusion: No perennial streams exist within the project area, so no impacts would occur to perennial streams. No seeps or springs occur within the project area. The nearest spring occurs approximately 1 mile east of the project area in Florida Canyon. A second spring is located northeast of the project area in Humboldt Canyon. Both springs are elevated above projected groundwater levels (i.e., perched) and would not be impacted by drawdown from dewatering operations. Groundwater modeling of recharge to Rye Patch Reservoir on the Humboldt River indicates that the mine dewatering operation would

reduce recharge to the Humboldt River by less than 0.02 percent.

Issue: Formation of a pit lake as a result of mine development and impacts to wildlife from degraded water quality.

Conclusion: The pit would be partially backfilled to a level above the pre-mining groundwater elevations in the pit area. Therefore, a pit lake is not expected to form.

Air Quality

Issue: Mining operations would potentially degrade air quality in the vicinity of the mine below applicable air quality standards.

Conclusion: Modeling and on-site monitoring results indicate that maximum concentrations of particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), nitrogen dioxide, carbon monoxide, and sulfur dioxide would not exceed Nevada or National Ambient Air Quality Standards. FCMI plans to follow common construction practices to minimize fugitive dust emissions and impacts to air quality. During mining operations, dust (PM_{10}) levels in the vicinity of the mine would be about the same as existing levels. The project would comply with all existing air quality standards in Nevada.

Soils

Issue: Loss of suitable soils or other growth media during salvage, stockpiling, or reclamation activities.

Conclusion: A total of 1.5 million yards of growth media would be salvaged and stockpiled and would be available for reclamation of disturbed land after mine closure. Stockpiles would be seeded with a cover crop and perennial species to prevent erosion and establishment of weedy species.

Issue: Erosion of disturbed or reclaimed sites thereby filling natural drainages.

Conclusion: Previous experience indicates that successful revegetation is likely to occur approximately 3 years after reseeding. At that time, plant cover would be sufficient to substantially decrease soil erosion.

Vegetation Resources

Issue: Revegetation of proposed disturbance areas comparable to pre-mining conditions.

Conclusion: The majority of the project area would be revegetated with native species if possible. Exotic species would be used if suitable native species are not available; natural biological diversity of the area would not be diminished; exotic and naturalized species can be confined within the project area; analysis of the ecological site inventory information indicates that a site will not support reestablishment of a species that historically was part of the natural community; and management objectives cannot be met with natives.

Wildlife and Fisheries Resources

Issue: Wildlife habitat disturbed or lost.

Conclusion: No riparian habitat would be affected. Loss of upland habitat would not exceed 860 acres of native vegetation. The value of habitat lost would be low to moderate, due to the proximity of the project to past and present disturbances and activities.

Issue: Loss of mule deer winter range.

Conclusion: A total of 860 acres of mule deer winter range would be removed for the life of the project.

Issue: Direct mortalities, habitat fragmentation, and animal displacement.

Conclusion: Direct mortalities would be limited. Habitats would be further fragmented and terrestrial wildlife would be displaced for the life of the project.

Issue: Impacts to resident and migratory birds.

Conclusion: Although the likelihood of disturbance is low, potential effects to breeding birds (e.g., passerines, raptors) could occur from direct habitat removal, disturbance to nest sites, and increased noise and human presence, particularly from mine exploration activities. Effects to upland game birds would be minor. The powerline electrocution hazards would be mitigated by structure design, and line strikes are expected to be minimal.

Issue: Potential impacts to bat hibernacula and day roost sites.

Conclusion: Mine exploration activities may directly or indirectly impact bat hibernacula and day roost sites within the historic Piedmont Mining Complex.

Issue: Acute or chronic toxic effects to resident and migratory wildlife.

Conclusion: Potential impacts from cyanide ingestion would be low, due to committed protection measures. Due to pit backfilling, no long-term water quality issues associated with a future pit lake would occur, relative to wildlife ingestion.

Issue: Impacts to wildlife from transporting hazardous chemicals to the mine.

Conclusion: No incremental increase in the shipment or use of hazardous materials would occur; therefore, no additional risk to aquatic or terrestrial resources located along the transportation route have been identified for the Proposed Action.

Issue: Impacts to area fisheries from dewatering activities.

Conclusion: No surface water resources or aquatic organisms would be impacted.

Special Status Species

Issue: Loss of or disturbance to roosting bat concentrations (e.g., hibernacula).

Conclusion: Direct or indirect impacts to roosting bats may occur from mine exploration activities. Noise and vibrations from drilling could indirectly disturb roosting bats, interrupt critical air flow for hibernacula, or affect shaft integrity, possibly resulting in roost abandonment or mortalities. Both hibernacula and day roost sites for sensitive bat species could be

adversely affected, resulting in adverse impacts to the local populations.

Issue: Impacts to nesting ferruginous hawks.

Conclusion: Proposed mine expansion, particularly exploration activities, may adversely impact breeding ferruginous hawks, if present.

Issue: Impacts to nesting burrowing owls.

Conclusion: A total of approximately 860 acres of potential habitat for the burrowing owl would be removed for the life of the project.

Range Resources

Issue: Loss of forage or grazing area leading to a permanent reduction of allowable animal unit months for the permittees within the affected allotment.

Conclusion: Mine expansion, operation, and reclamation would result in the permanent loss of 1 animal unit months or approximately 1 percent of the active grazing preference.

Land Use and Access

Issue: Potential realignment of the communication tower access road.

Conclusion: This road would not be realigned under the Proposed Action.

Aesthetics (Visual and Noise Resources)

Issue: Visual contrasts with elements of the characteristic landscape in exceedence of BLM Visual Resource Management (VRM) objectives.

Conclusion: The Proposed Action and the North Extension of the Heap Leach Pad Alternative would result in moderate contrasts with existing forms, lines, and textures of the characteristic environment as a result of the construction of the new heap leach facility and expansion of the waste rock dumps. These contrasts would exceed VRM objectives during the life of mining. If proposed reclamation efforts were successful, visual contrasts would be reduced to acceptable levels within 10 years of the reclamation period.

Cultural Resources, Ethnography, and Paleontology

Issue: Direct physical disturbance of cultural resources or traditional use sites that are listed on or are eligible to the National Register of Historic Places or are protected under state or other Federal statues.

Conclusion: Environmental protection measures involving cooperation between FCMI, the BLM, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation would be implemented if cultural resources are discovered or affected during construction or operation activities. Based on the protection measures, proper steps would be taken to evaluate the quality of the resource, to determine whether the loss is acceptable, and to mitigate losses that are not acceptable. In some cases, construction activities could lead to the permanent loss of cultural resources. One unevaluated site could be directly impacted (CrNV-02-3344).

Issue: Indirect impacts (e.g., casual collecting) from development.

Conclusion: Indirect impacts would be controlled by limiting employee access to known archaeological sites, marking boundaries, educating employees about the significance of cultural resources, implementing erosion protection measures on exploration and access roads and drill pads, and implementing a strict management policy restricting the casual collection of artifacts from the project area.

Issue: Impacts to significant paleontological resources.

Conclusion: Although paleontological resources have been identified in geologic formations that occur in the vicinity of the project area, no deposits have been located in the project area to date. Mitigation measures designed to reduce impacts to previously unidentified paleontological resources that may be located during the Proposed Action would be implemented if paleontological deposits are identified during project construction and operation.

Hazardous Materials

Issue: Impacts of a sodium cyanide release on sensitive resources.

Conclusion: A release of sodium cyanide would most likely occur during transport to the site. The likelihood of a sodium cyanide release during transport is estimated to be less than 0.02 releases over the life of the project. All hazardous material carriers comply with Federal and state hazardous materials transportation regulations. The potential also exists for impacts to sensitive receptors resulting from a release of sodium cyanide at the mine site; however, potential impacts have been minimized by the construction of a series of dlversion and containment structures. FCMI maintains an Emergency Response Plan to minimize impacts to sensitive resources from a sodium cyanide release.

Issue: Impacts of mining on human health.

Conclusion: None of the process chemicals or fuels utilized in large quantities are carcinogenic. Emergency response and spill response plans mitigate any spills or releases of hazardous chemicals immediately. The primary possibility of endangerment of human health is due to a release during transport. The number of transportation-related releases over the life of the project has been estimated at about 0.05. However, the probability of such a release affecting human health would be even less.

AGENCY-PREFERRED ALTERNATIVE

In accordance with the National Environmental Policy Act, Federal agencies are required by the Council on Environmental Quality (40 Code of Federal Regulations 1502.14) to identify their preferred alternative for a project in the Draft EIS, if a preference has been identified, and in the Final EIS prepared for the project. The preferred alternative is not a final agency decision; it is rather an indication of the agency's preliminary preference. The alternative identified below is the BLM's preferred alternative at the Draft EIS stage in the environmental review process. This preference may be changed based on the agency and public comments that are received on this Draft EIS. As indicated above, an

agency-preferred alternative also will be presented in the Final EIS. The BLM's preference at this time considers all information that has been received and reviewed relevant to the proposed project. The agency preferred alternative is the Proposed Action as described in the EIS with all appropriate mitigation.

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1.0 INTRODUCTION

Florida Canyon Mining, Inc. (FCMI) has submitted a *Plan of Operations Amendment #10 for Mine Expansion and Reclamation Activities* for the Florida Canyon Mine (FCMI 1996) to the Winnemucca Field Office of the Bureau of Land Management (BLM). FCMI prepared the amended plan for review and approval by the Nevada Department of Environmental Protection (NDEP) and the BLM. The BLM and the NDEP entered into a statewide Memorandum of Understanding, under which BLM is the lead agency in administration of the Florida Canyon Mine.

FCMI proposes to construct new facilities and expand existing gold mining operations within the Imlay Mining District in Pershing County, Nevada. The mine is located on public and private lands adjacent to Interstate Highway 80 approximately 35 miles northeast of Lovelock and approximately 38 miles southwest of Winnemucca, Nevada (Maps 1-1 and 1-2). FCMI has been operating the Florida Canyon Mine since 1986. Historical mining in and near the proposed project location dates back to the 1860s. The Imlay Mining District is known mainly for the production of gold, silver, mercury, and tungsten.

The Imlay Mining District was organized in 1860, when gold was discovered in Humboldt Canyon. Numerous claims were staked in the area and exploration activities continued for several years, attracting a population of 500 to Humboldt City by 1863. However, activity was sporadic until 1906 when the start-up of the Imlay gold mine and the Black Jack mercury mine sparked renewed mining activity and exploration. Continued prospecting in the district resulted in the production of gold, silver, mercury, and tungsten from various small mines. The Standard gold mine was the most productive operation and from 1939 to 1942 and 1946 to 1949 yielded about 1 million dollars in gold and silver.

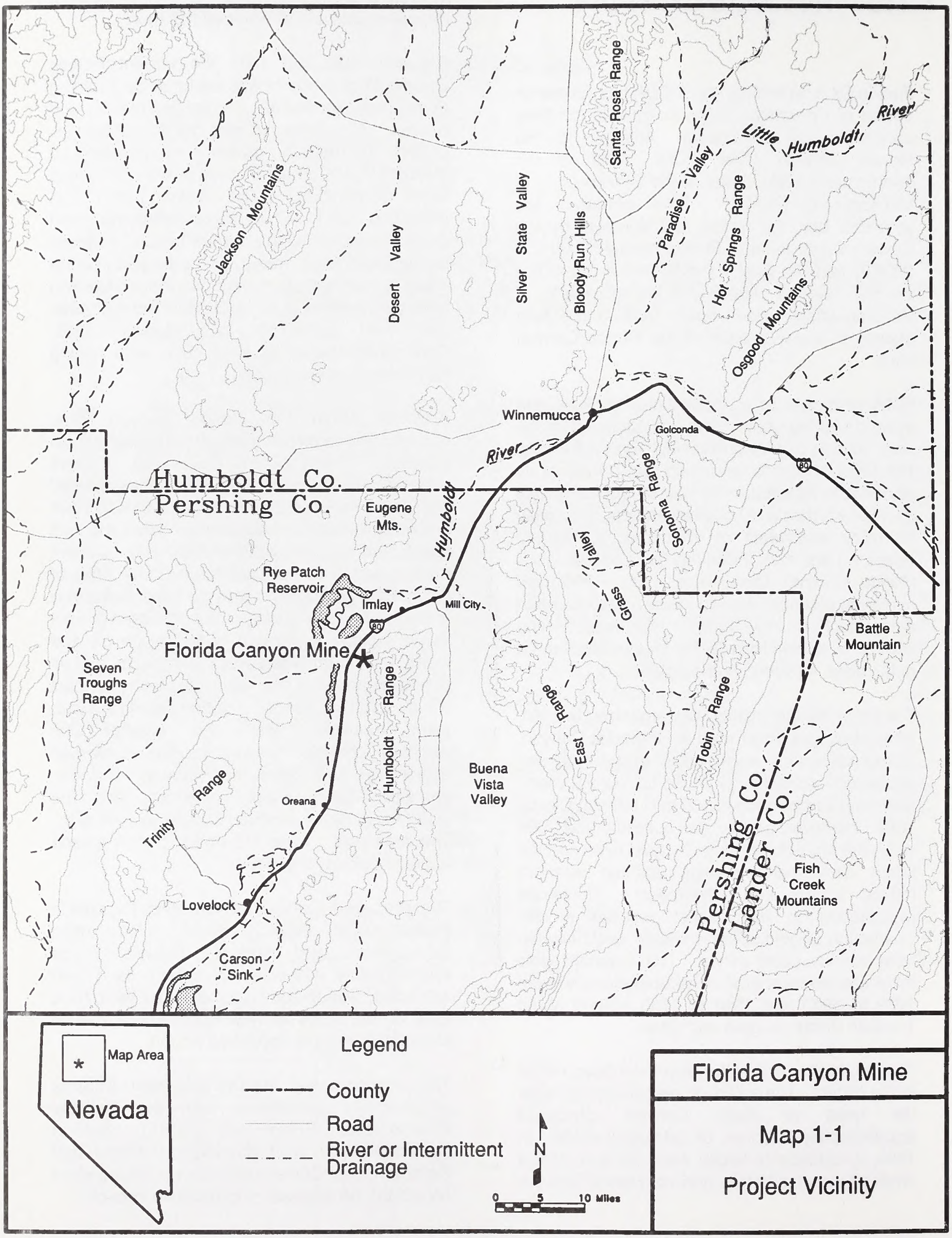
Fluorite, kaolin, and sulfur also have been mined in the district. The Valerie fluorspar deposit, near the head of Black Canyon, produced approximately 723 tons of calcium fluoride. In 1935, 2 carloads of kaolin were shipped from a small pit about 0.25 mile north of Florida Canyon. In 1936, 8 carloads of sulfur were shipped from a deposit southwest of Humboldt Station.

Between 1969 and 1981 the current Florida Canyon Mine property was explored by 3 mining companies; Homestake, Cordex Exploration, and Asarco. All of them chose not to pursue the project. In 1982, the property was acquired by Montoro Gold Company, a subsidiary of Pegasus Gold Corporation. The land position was expanded and a geologic mapping and geochemical sampling program began. Pegasus began exploration drilling on the project in June 1983. A Plan of Operation for the Florida Canyon Mine was submitted to the BLM in October 1985 and was approved in February 1986. Construction began in early 1986, with mining beginning in August 1986.

Activities within the Florida Canyon Mine operations area have expanded periodically since production began in 1986 (Table 1-1). Current mine facilities consist of a series of connected pits, waste rock disposal areas, a heap leach pad and associated processing plant, access and haul roads, and ancillary facilities (Map 1-3). Current mine operations are described in the *Plan of Operations Amendment #10 for Mine Expansion and Reclamation Activities*. The proposed project would include expansion of the open pit and North and South Waste Rock Dumps, as well as the development of the new south leach pad; haul road; solution ponds; solution corridor/road; plant; monitoring wells/road; crusher site; sediment ponds; growth media stockpiles; exploration drill sites and roads; diversion channels; water supply pipelines; and the realignment of the Johnson Canyon access road. The anticipated mine life under the Proposed Action would be 5 years.

The proposed Florida Canyon Mine Expansion Project (FCMI Project) would include mine development and surface disturbance on approximately 413 acres of private land and 447 acres of BLM-administered public land, for a total of 860 acres of new surface disturbance associated with the Proposed Action.

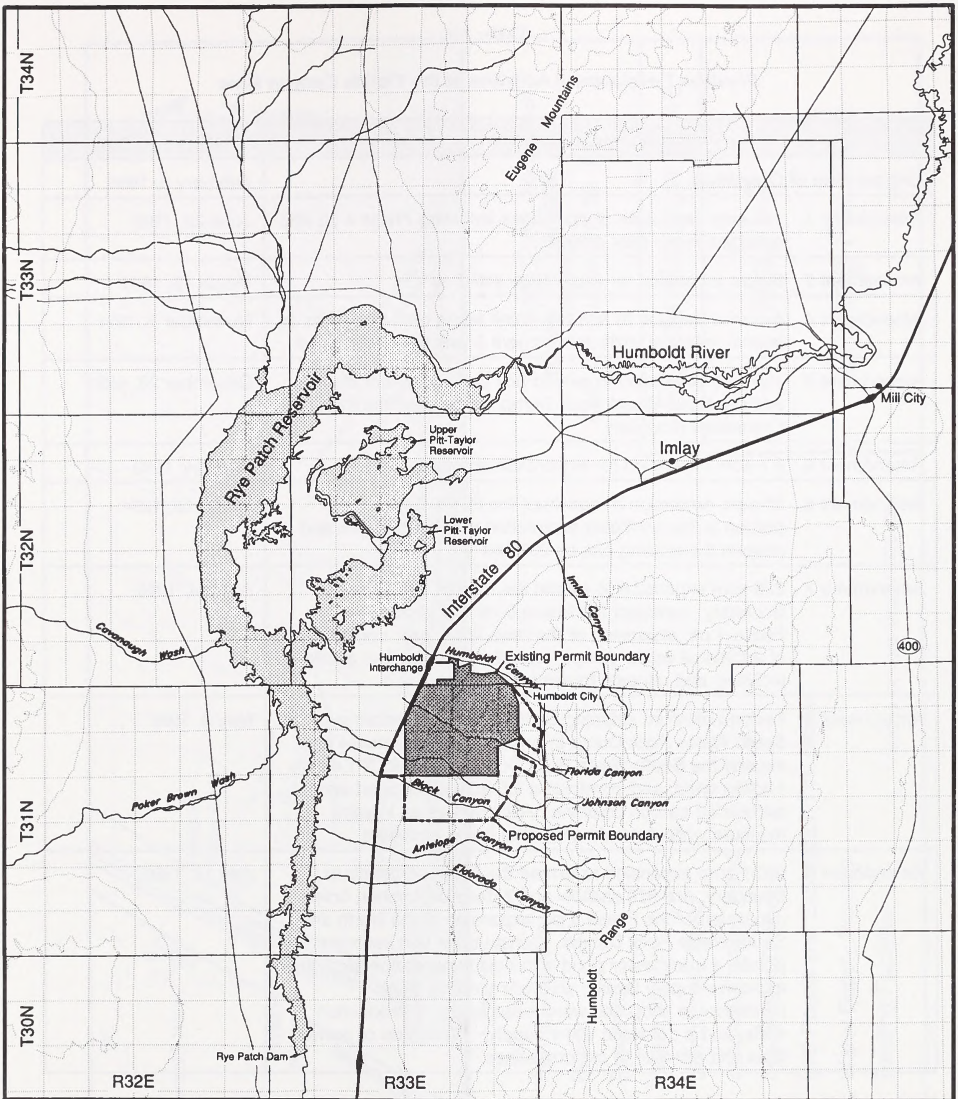
This environmental impact statement (EIS) is prepared in compliance with the National Environmental Policy Act (NEPA), and in accordance with BLM Handbook H-1790-1 and Nevada State Office Instruction Memorandum NV-90-435 on analysis of cumulative impacts.



Florida Canyon Mine

Map 1-1

Project Vicinity



Florida Canyon Mine

Map 1-2

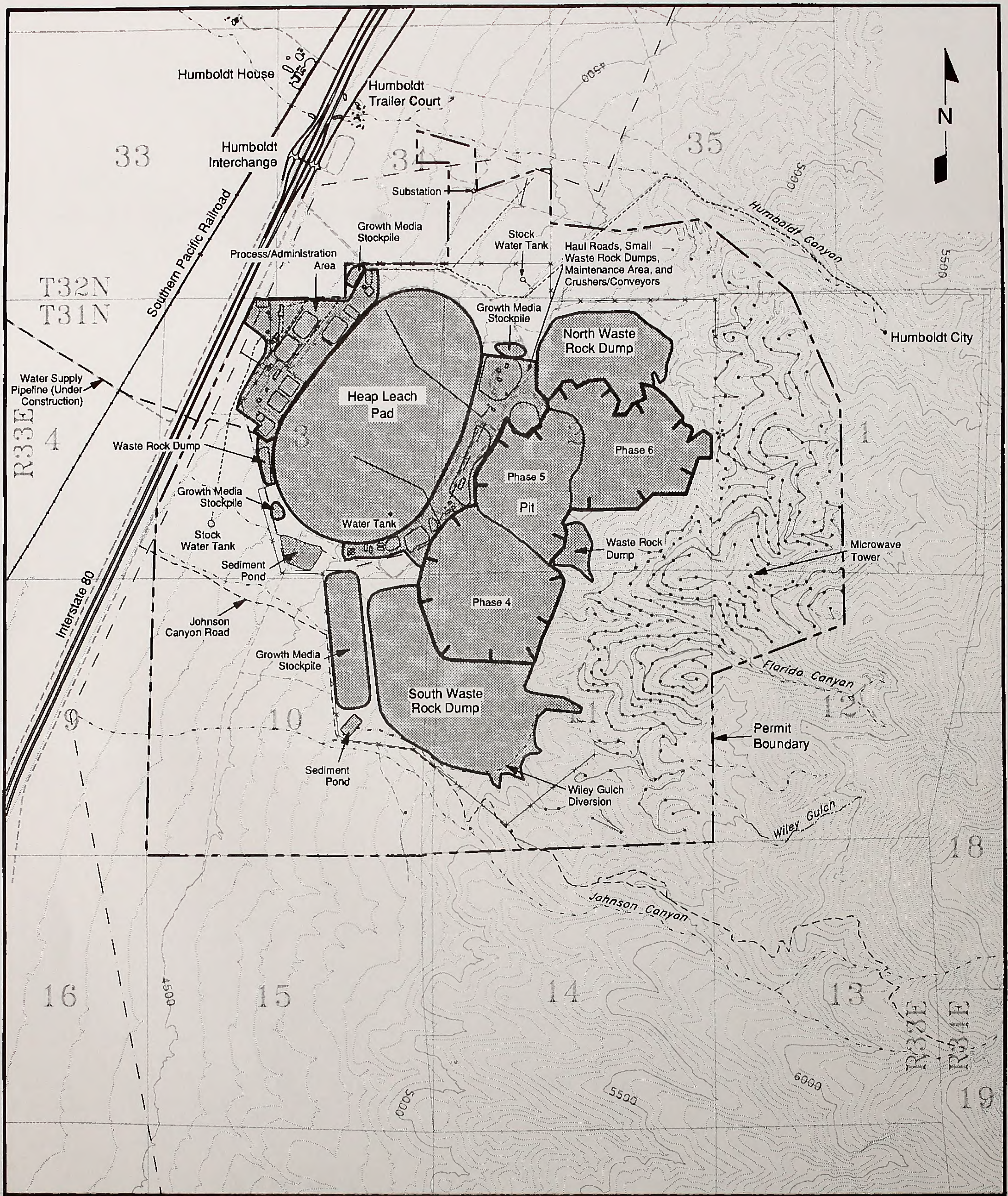
Proposed Action and Vicinity Map

Table 1-1

Previous Development Activities at the Florida Canyon Mine

Development Activity		Approval Date
Original Plan of Operations		February 6, 1986
Amendment 1	295-acre expansion of operations including Phase 4 pit and enlarged waste rock dumps	June 20, 1990
Amendment 2	6-acre expansion for exploration activities	March 19, 1991
Amendment 4	6-acre expansion to add two small waste rock dumps as an interim measure while Amendment 3 was being evaluated	November 7, 1991
Amendment 3	129-acre expansion to extend pits and waste rock dumps, add the North Waste Rock Dump, and extend the Plan of Operations Boundary	December 26, 1991
Amendment 5	0.7-acre expansion for exploration activities	June 24, 1993
Amendment 6	22-acre expansion to construct the Phase 5 pit over a portion of the northeast exploration area disturbance and deepen the existing pits by 200 feet	March 25, 1994
Amendment 7	238-acre expansion to extend the Plan of Operations Boundary; construct the Phase 6 pit and expand the Phase 4 pit; expansion of the heap leach pad; construction of additional waste dumps, topsoil stockpiles, and ancillary facilities; and relocate transmission lines	April 14, 1995
Amendment 9	Perform alluvium stripping on the top of the reclaimed South Waste Rock Dump in preparation to reactivate and expand the South Waste Rock Dump; construct a 1.4-acre cooling pond; and construct a 4.0-acre utility pond and associated carbon columns. Approved as an interim measure while Amendment 8 was being evaluated	May 9, 1996
Amendment 8	260.5-acre expansion to extend the Plan of Operations boundary; drill 329 shallow and 7 deep exploration holes; expansion of the Phase 5 pit; expansion of the North and South Waste Rock Dumps. Construction of 5 sediment ponds, a truck water pond with dust suppression silos, an explosive supply facility, an office building, truck maintenance shop and warehouse facility, 2 production wells, and a domestic water supply. Relocation of power lines and removal of old powerlines.	July 17, 1996

Source: BLM 1996.



Legend

- Permit Boundary
- Fence
- Powerline
- Water Pipeline
- Unimproved Road
- Johnson Canyon Road
- Intermittent Drainage
- Drill Roads and Exploration Drill Holes
- Water Supply Pipeline
- Existing Facilities

0 1000 2000 3000 Feet

Contour Interval is 50 Feet

Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 1-3

Existing Facilities

This EIS considers the quality of the human environment based on the physical impacts to public and private lands that may result from mining activities at the Florida Canyon Mine. The proposed mining activities located on public lands are subject to review and approval by the BLM pursuant to the Federal Land Policy and Management Act of 1976 (FLPMA) and subsequent surface management regulations (43 Code of Federal Regulations [CFR], Subpart 3809). These activities and their approval by the BLM pursuant to the FLPMA constitute a Federal action, and are thus subject to NEPA. The BLM has determined that the FCMI Project constitutes a major Federal action and that an EIS would be necessary to fulfill NEPA requirements. The BLM-Winnemucca District is the Federal lead agency and the Nevada Division of Wildlife (NDOW) and the U.S. Army Corps of Engineers (USCOE) are the cooperating agencies for this EIS. The NDOW is responsible for providing information regarding wildlife species and habitat in the project analysis area. The USCOE is responsible for permitting associated with Section 404 of the Clean Water Act.

1.1 Purpose of and Need for the Proposed Action

FCMI proposes to expand mining operations at the Florida Canyon Mine for the purpose of extracting economically recoverable gold reserves known to exist adjacent to existing pit areas in an environmentally compatible manner. FCMI has identified the following economically driven project objectives:

- Develop gold mining facilities in the FCMI Project area;
- Extract economically recoverable gold which exists in the project area;
- Operate and reclaim the project area in an efficient, environmentally conscientious, and safe manner; and
- Meet or exceed Federal, state, and local regulations for the protection of human health and safety and the environment.

The project need is reflected by the demand for gold identified in national and global markets.

1.2 Relationship to BLM and Non-BLM Policies, Plans, and Programs

The BLM has the responsibility and authority to manage the surface and subsurface resources on public lands within its charge. FCMI's use of public land in the Winnemucca District requires conformance with BLM's surface management regulations (43 CFR 3809), as well as various statutes, including the FLPMA, as amended. The BLM must review FCMI's plans for development to ensure the following:

- Adequate provisions are included to prevent unnecessary or undue degradation of Federal lands and to protect the non-mineral resources of the Federal lands;
- Measures are included to provide for reclamation of disturbed areas; and
- Compliance with applicable state and Federal laws is achieved.

The BLM's Sonoma-Gerlach Resource Area Management Framework Plan contains no constraints that conflict with the Proposed Action. Management activities for the Proposed Action area are identified as livestock grazing, wildlife habitat, and recreation. Mineral resource development is in conformance with the Resource Area Management Framework Plan, which states: "Make public lands and Federally-owned minerals available for the exploration and development of mineral and material commodities."

1.3 Authorizing Actions

A Notice of Intent (NOI) to prepare the EIS was published in the Federal Register on December 13, 1996. The NOI invited public scoping comments to be sent to the BLM through January 24, 1997. On December 24, 1996, copies of the *Public Invited to Comment on the Florida Canyon Project* news release were issued to two Nevada newspapers (*Lovelock Review Miner,*

Humboldt Sun) and a local radio station. Public meetings were held in Lovelock and Winnemucca, Nevada. A total of two members of the public attended the Lovelock meeting on January 7, and six members of the public attended the Winnemucca meeting on January 8. Comments recorded during these meetings are available in the BLM's Winnemucca Field Office. No written comment letters were received by the BLM within the public comment period.

In addition to the EIS, implementing the proposed project or alternatives would require authorizing actions from other Federal, state, and local agencies with jurisdiction over certain aspects of the proposed project. Table 1-2 lists the required permits or approvals and the responsible regulatory agency.

1.4 Organization of the Environmental Impact Statement

This EIS follows the Council on Environmental Quality (CEQ) recommended organization (40 CFR 1508.9): Chapter 1.0 provides descriptions of the Proposed Action, relevant history of the project vicinity, purpose of and need for the Proposed Action, the environmental review process, applicable regulatory requirements and coordination, and organization of the EIS; Chapter 2.0 describes the Proposed Action and Alternatives; Chapter 3.0 describes the affected environment, environmental consequences, mitigation and monitoring, cumulative impacts, and residual adverse impacts; and Chapter 4.0 summarizes consultation and coordination for preparation of the EIS; Chapter 5.0 presents the list of preparers; and Chapter 6.0 is a list of references. Copies of supporting documents are on file in the BLM's Winnemucca Field Office and the BLM Nevada State Office in Reno.

Table 1-2

Major Permits and Approvals Required for the Florida Canyon Mine Expansion Project

Permit/Approval	Granting Agency
Approval of Plan of Operations, Rights-of-Way Permits	Bureau of Land Management
Clean Water Act Section 404 Permit	U.S. Army Corps of Engineers
Small Quantity Hazardous Waste Generator	U.S. Environmental Protection Agency
Explosives Permit	Bureau of Alcohol, Tobacco, and Firearms
Surface Disturbance Permit (Air Quality)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality
Permit to Operate (Air Quality)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality
Water Pollution Control Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Reclamation Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Permit to Appropriate Water and to Construct Impoundments	Nevada Department of Conservation and Natural Resources, Division of Water Resources
Industrial Artificial Pond Permits	Nevada Department of Conservation and Natural Resources, Division of Wildlife
Approval to Operate a Sanitary Landfill	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Solid Waste
General Discharge Permit (Storm Water, Septic Systems)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Water Pollution Control
Hazardous Materials Storage Permit	State of Nevada, Fire Marshal Division
Domestic Water Supply Permit	Nevada Department of Conservation and Natural Resources Division of Environmental Protection, Bureau of Health Protection Services

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

FCMI proposes to expand the Florida Canyon Mine. The *Plan of Operations Amendment #10 for Mine Expansion and Reclamation Activities* (FCMI 1996) for the Florida Canyon Mine has been submitted by FCMI to the BLM, Winnemucca Field Office, in compliance with 43 CFR 3809. This chapter describes the proposed Florida Canyon Mine expansion as discussed by FCMI in the plan of operations (Proposed Action), as well as the North Extension of the Heap Leach Pad Alternative and No Action Alternative analyzed in the EIS, and a list of other potential alternatives that were considered but eliminated from detailed analysis. This chapter also includes a comparative impact analysis of the project alternatives.

2.2 Proposed Action

As illustrated on Map 1-1, the FCMI Project is located immediately east of Interstate 80 (I-80), approximately 35 miles northeast of Lovelock and 38 miles southwest of Winnemucca, Nevada, at elevations ranging between 4,300 and 6,200 feet above mean sea level.

The land ownership within the project area is illustrated on Map 2-1. FCMI has been operating the Florida Canyon Mine since 1986. Historical mining in the proposed project vicinity dates back to the 1860s.

The land that would be directly affected by the Proposed Action includes approximately 860 acres. The project involves a single ore deposit within the Grass Valley Formation that would continue to be mined by open pit methods. Other facilities include waste rock dump expansion areas; crushing and agglomeration facilities; heap leaching facilities; process area; and ancillary facilities including access and haul roads, exploration drill roads and sites, growth media stockpiles, diversion channels, sedimentation ponds, powerline, conveyor, and water pipelines.

Map 2-2 presents the general facilities arrangement. Table 2-1 presents a summary of existing surface disturbance and Table 2-2 presents a summary of the estimated surface disturbance for the Proposed Action.

2.2.1 Work Force and Schedule

Project construction and pre-stripping would be conducted over approximately a 1-year period. The number employed for construction activities would vary during this period, with a peak construction work force of 104 workers, and an average construction work force of 43. The total construction payroll is estimated to be $1.9 million. It is anticipated that the majority of the construction work force would be hired from non-local areas. Average operations work force of 301 is anticipated through the life of the mine, with an average annual payroll of $13.3 million between 1998 and 2002. The current operations work force is 328. A conceptual schedule showing possible sequencing of principal pre-development, construction, operation, and reclamation activities is presented on Figure 2-1.

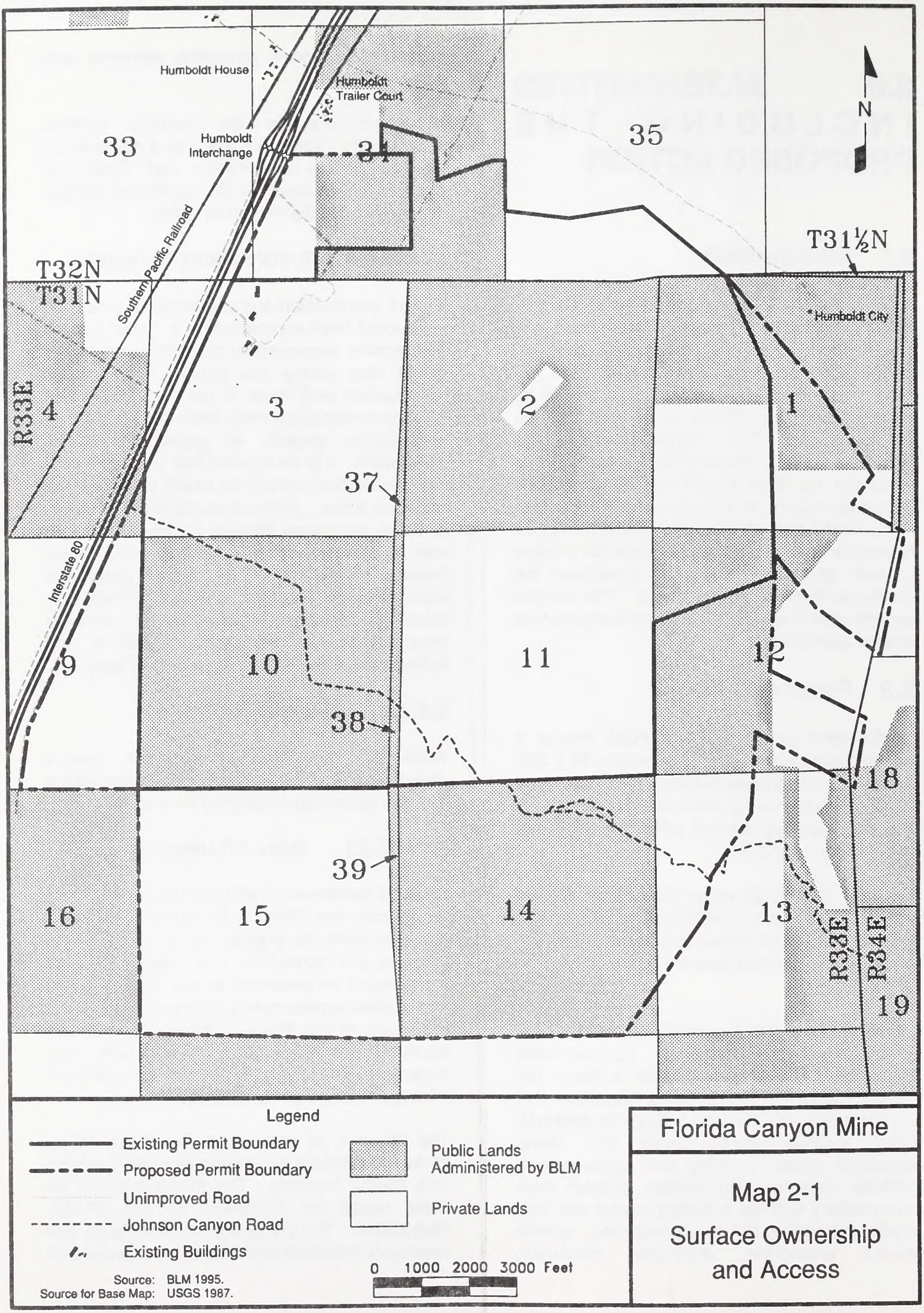
2.2.2 Mining Operations

Table 2-2 provides the estimated surface disturbance acreage and land status associated with the expansion of existing mine facilities.

2.2.2.1 Open Pit Development

Open pit development includes the expansion of the existing pits (Phase 4, 5, and 6) by 88 acres and deepening the existing pits by 10 to 60 feet (Map 2-2 and Figure 2-2). The Phase 4 and 5 pit areas would be expanded to the northwest and would affect approximately 13 acres of land. The expansion of the Phase 6 pit to the east and south would affect 75 acres of land; this expansion area would be utilized for additional mining and highwall stabilization.

The Phase 4 pit area would be deepened by 10 feet to continue the present practice of mining with 20-foot benches. The Phase 5 and 6 pit areas would be deepened 40 and 60 feet, respectively. The pit elevations associated with previously permitted actions and the proposed pit


Humboldt House
Humboldt Trailer Court
Humboldt Interchange
Southern Pacific Railroad
Interstate 80
Humboldt City
N
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T31N
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R34E
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35
1
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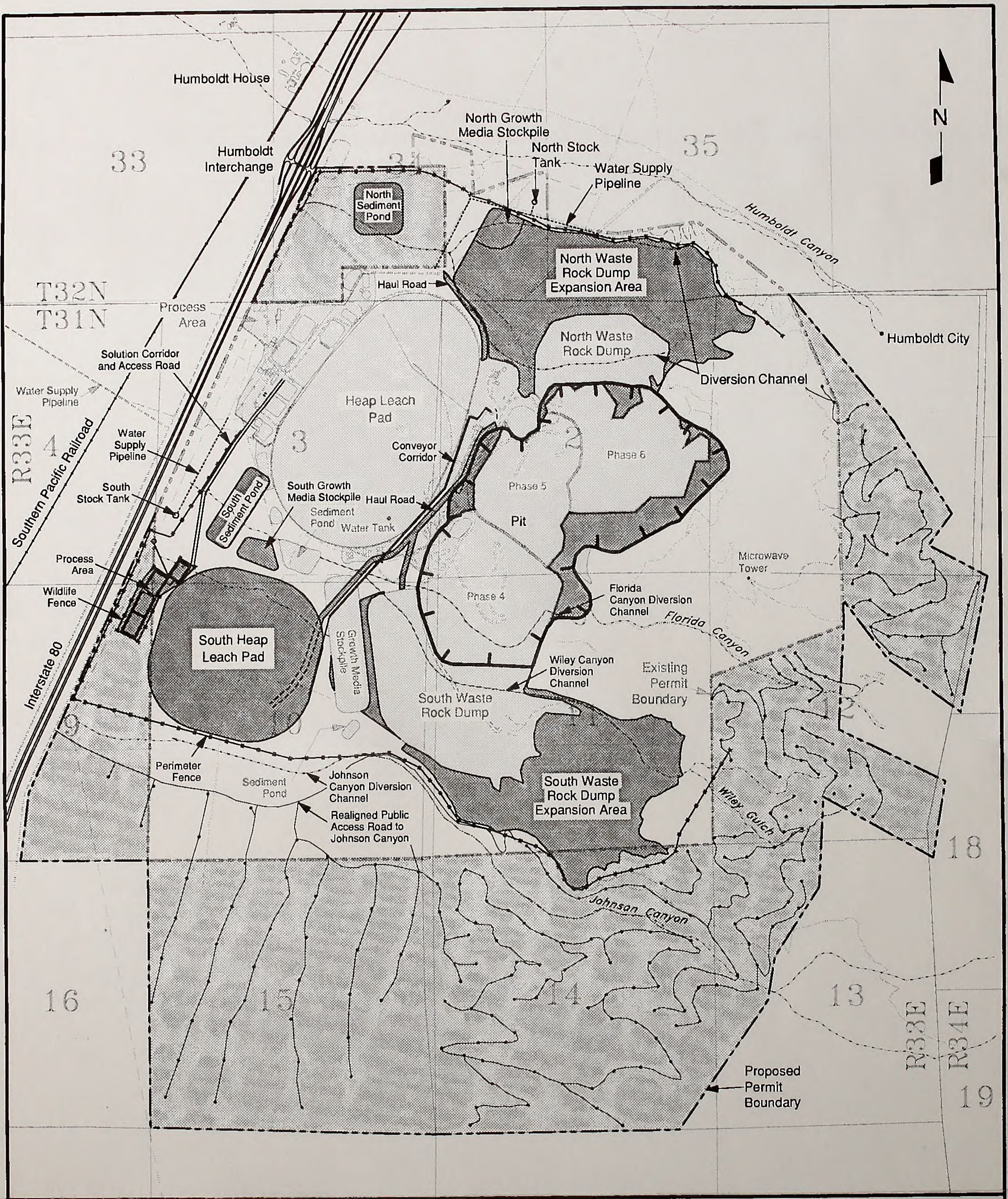
16
18
19
37
38
39
Legend
Existing Permit Boundary
Proposed Permit Boundary
Unimproved Road
Johnson Canyon Road
Existing Buildings
Public Lands Administered by BLM
Private Lands
0 1000 2000 3000 Feet
Source: BLM 1995.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 2-1
Surface Ownership and Access



Legend

Existing Permit Boundary	Existing Facilities
Proposed Permit Boundary	Proposed Action
Existing Fence	Permit Boundary Expansion Area
Proposed Fence	
Powerline	
Water Pipeline	
Water Supply Pipeline	
Unimproved Road	
Realigned Johnson Canyon Road	
Drill Roads and Exploration Drill Holes	
Intermittent Drainage	

0 1000 2000 3000 Feet

Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 2-2

Proposed Action

Table 2-1

Acres of Existing Disturbance at the Florida Canyon Mine

Facility	Public Land	Private Land	Total
North Waste Rock Dump	105	0	105
South Waste Rock Dump	132	124	256
Existing Heap Leach Pad	57	264	321
Crushers and Shops	58	20	78
Plant and Offices	0	30	30
Roads	43	26	69
Ponds	4	20	24
Pits	152	75	227
Water System and Wells	1	1	2
Exploration Drill Pads and Roads	84	63	147
Total Disturbance	636	623	1,259

Table 2-2

Proposed Action - Estimated Surface Disturbance Acreage by Facility and Land Status

Facility	Public Land	Private Land	Total
North Waste Rock Dump	80	97	177
South Waste Rock Dump	12	205	217
South Heap Leach Pad	195	8	203
Crushers and Shops	10	25	35
Plant and Offices	0	1	1
Roads	4	7	11
Ponds	10	26	36
Pits	70	18	88
Water System and Wells	1	0	1
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads	65	10	75
Total Disturbance	447	413	860

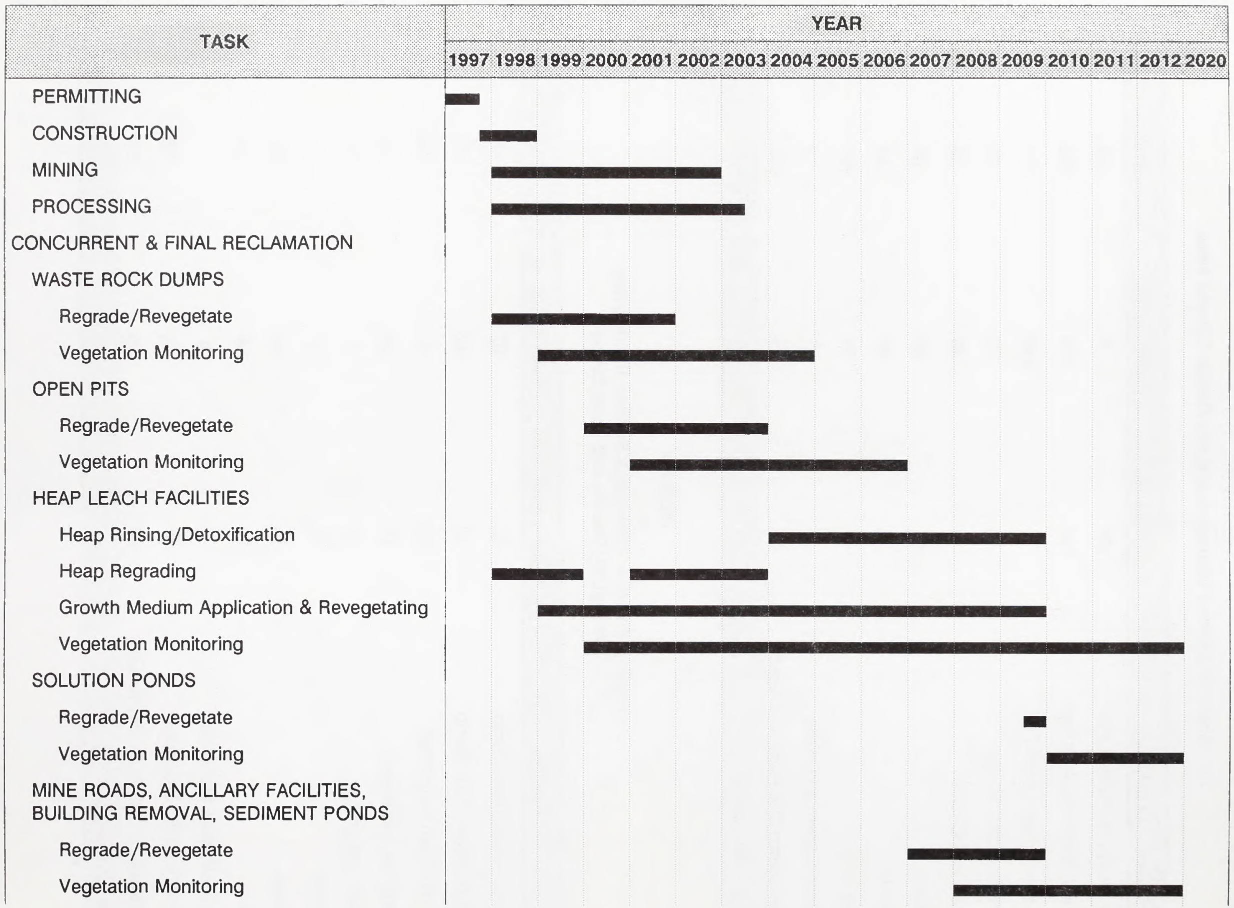
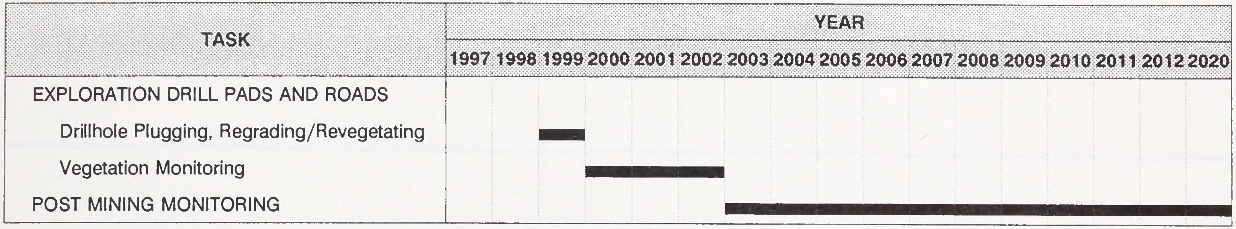
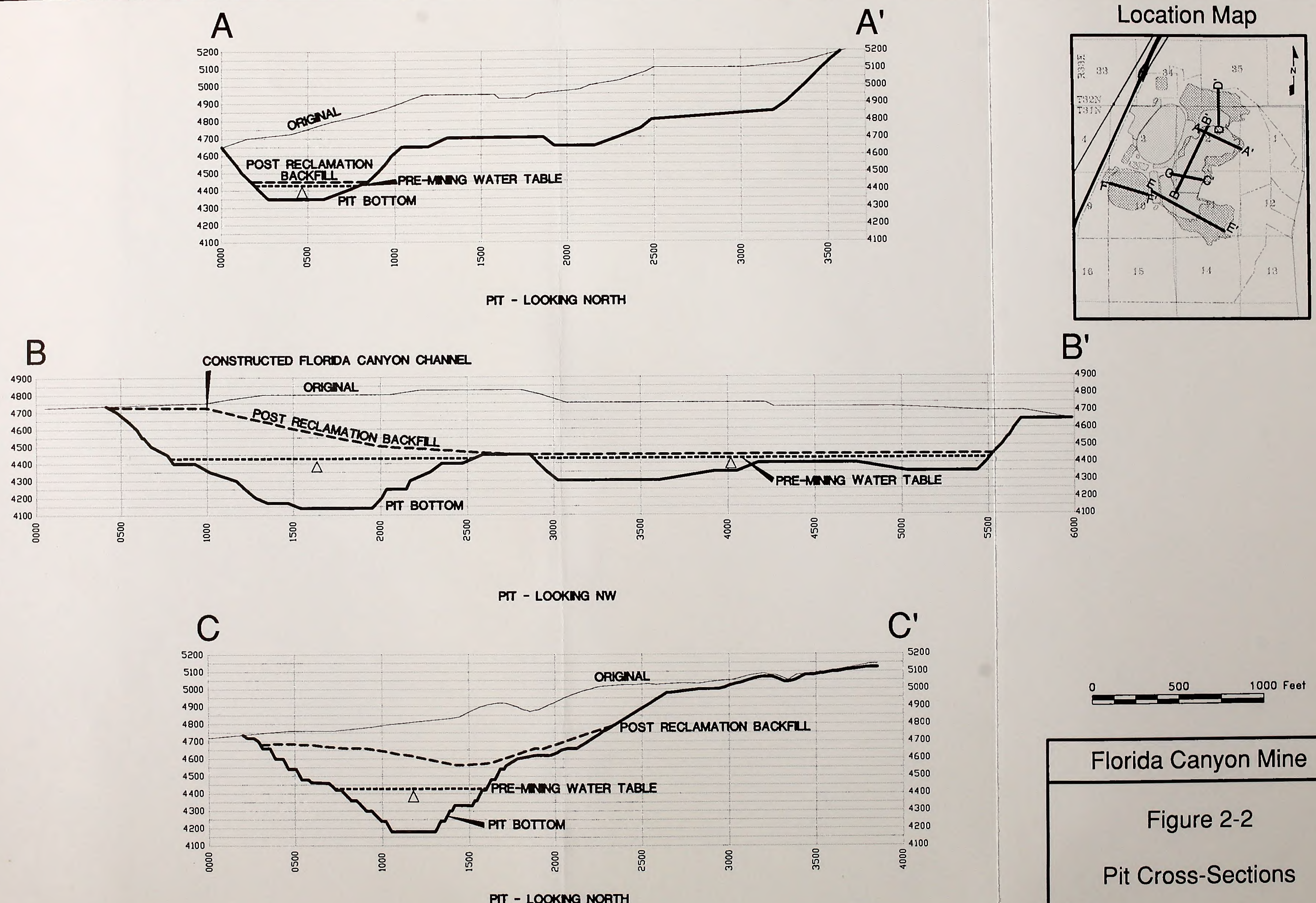


FIGURE 2-1. PROPOSED FLORIDA CANYON MINE EXPANSION PROJECT SCHEDULE



Concurrent reclamation would be conducted through 2002. Final reclamation would begin in 2003.

FIGURE 2-1 (CONTINUED)



Florida Canyon Mine

Figure 2-2

Pit Cross-Sections

elevations for the three existing pits that would be deepened include:

- Phase 4 Pit - 4,150 feet (previously permitted actions) and 4,140 feet (Proposed Action);
- Phase 5 Pit - 4,300 feet (previously permitted actions) and 4,260 feet (Proposed Action); and
- Phase 6 Pit - 4,380 feet (previously permitted actions) and 4,320 feet (Proposed Action).

2.2.2.2 Drilling and Blasting

The majority of the waste rock and all of the ore would require drilling and blasting. Material would be mined on 20-foot to 25-foot benches. Diesel-powered rotary hammer drills would be used to drill blast holes on a regular spacing. Blast holes would be charged with an ammonium nitrate/fuel oil mixture by means of a truck-mounted mixing/dispensing unit. Unconsolidated gravels and growth media that do not require drilling and blasting would be ripped with a dozer, as required, for removal.

Usually, one blast would occur each day at mid-day or late afternoon. Blasting would occur only during daylight hours and would meet applicable safety standards.

2.2.2.3 Loading and Hauling

Blasted ore and waste rock would be loaded with conventional mechanical shovels and/or front-end loaders. The ore and waste rock would be hauled by conventional off-highway mine trucks.

2.2.3 Roads

2.2.3.1 Haul Roads

The proposed locations of the haul roads from the pit to the processing area, growth media stockpile areas, and waste rock dumps are shown on Map 2-2. The haul roads would be designed to accommodate appropriate mine equipment, including large mine haul trucks, and to meet United States Mine Safety and Health Administration (MSHA) requirements. Where practical, the haul roads would be sloped into the hillside, and drainage would be provided by ditches along the roadway on the uphill side, with culverts under the roadway at required locations. A safety berm would be constructed on the downhill side. Haul roads would be enclosed within the fenced mine site and would not be accessible to the general public.

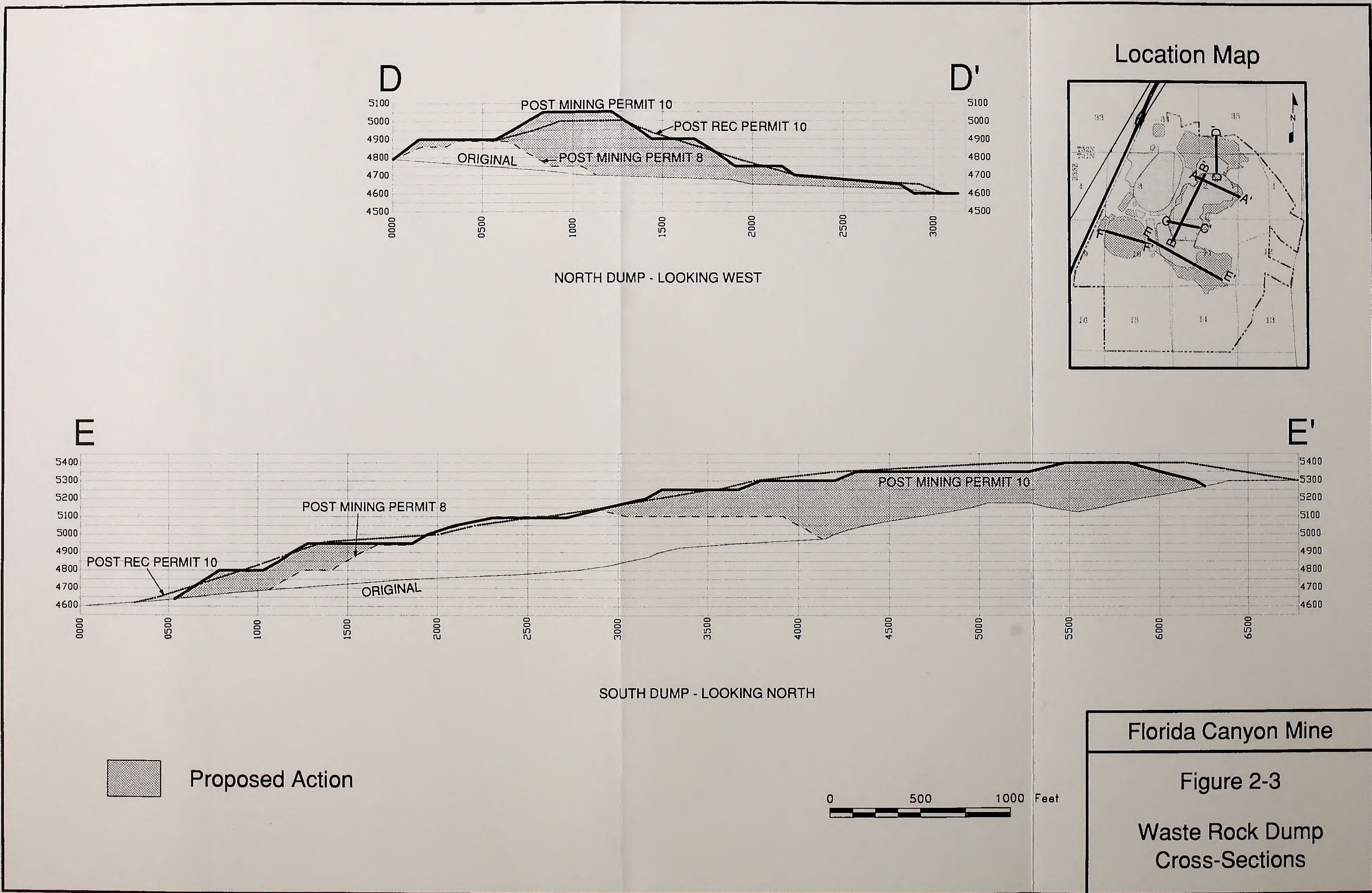
2.2.3.2 Snow Removal and Management

Snow removal and management within the operations area are required to ensure safe winter operation. Drifting snow is expected in some areas and snow fences may be constructed as a means of controlling the pattern of drifting. Portions of the primary inner-project service roads and access roads would be cleared utilizing a grader. Proper road maintenance would include the placement of gravel or sand to maintain driving surfaces. Care would be taken to minimize the removal of the road surface during snow removal. Snow would be moved to the downhill side of the roadways. Excessive snow from the work areas also would be removed by front-end loaders and trucks. In order to maintain roadway surfaces, dry road surfacing material would occasionally be placed and graded.

2.2.4 Waste Rock Dumps

Expansion of the North and South Waste Rock Dumps would occur on previously disturbed land (i.e., portions of the existing North and South Waste Rock Dumps and other miscellaneous disturbed land) and undisturbed land (Map 2-2). Waste rock also would be placed in available portions of the pits. An additional 394 acres would be needed to accommodate an additional 147 million tons of waste rock and up to 30 million tons of run-of-mine stockpile. Depending on economics, the stockpile may remain in the waste dump at closure. Waste rock dump cross-sections are illustrated on Figure 2-3.

All waste rock, whether delivered to waste rock dumps or to the pits as backfill, would be contoured to the final reclamation configuration and covered with a minimum 1-foot depth of growth media in preparation for reclamation and revegetation.



Florida Canyon Mine

Figure 2-3

Waste Rock Dump Cross-Sections

Growth media stripped from the North and South Waste Rock Dumps would either be stockpiled for use during final reclamation or hauled to areas prepared for growth media application. Growth media stripped for the South Waste Rock Dump expansion area would be delivered to the previously approved growth media stockpile located immediately west of the expansion area. Growth media stripped from the North Waste Rock Dump expansion area would be delivered to the north growth media stockpile, which adjoins the northwestern portion of the waste rock dump.

2.2.4.1 North Waste Rock Dump

The North Waste Rock Dump expansion would disturb 177 acres; 80 and 97 acres of public and private land, respectively. The expansion of this waste rock dump would allow placement of an additional 80 million tons of waste rock generated from the Phase 4, 5, or 6 Pits and possibly run-of-mine stockpile. The approximate ultimate elevation of this waste rock dump would be 5,050 feet. Waste rock would be placed in approximately 50- to 150-foot lifts at the angle of repose (1.4H:1V).

2.2.4.2 South Waste Rock Dump

Expansion of the South Waste Rock Dump would disturb 217 acres; 12 and 205 acres of public and private land, respectively. The expansion of this waste rock dump would allow placement of an additional 67 million tons of waste rock that would be generated from the deepening and expansion of Phase 4, 5, or 6 Pits and possibly run-of-mine stockpile. The approximate ultimate elevation of this waste rock dump would be 5,400 feet. Prior to placement of waste rock on the previously reclaimed slopes, a minimum of 1 foot of growth media would be stripped and stockpiled. Waste rock would be placed in approximately 50- to 150-foot lifts at the angle of repose (1.4H:1V).

2.2.5 Crushing and Agglomeration Facility

Crushed and agglomerated ore would be delivered from the existing circuit to the south heap leach pad via a series of portable bridge conveyors. A weak sodium cyanide solution would be applied after the ore is on the pad. A radial stacker or haul trucks would be used to place conveyed ore on the pad. A conveyor corridor is proposed to move crushed ore from an existing crusher to the South Heap Leach Pad.

2.2.6 South Heap Leach Pad

2.2.6.1 Leach Pad Design and Construction

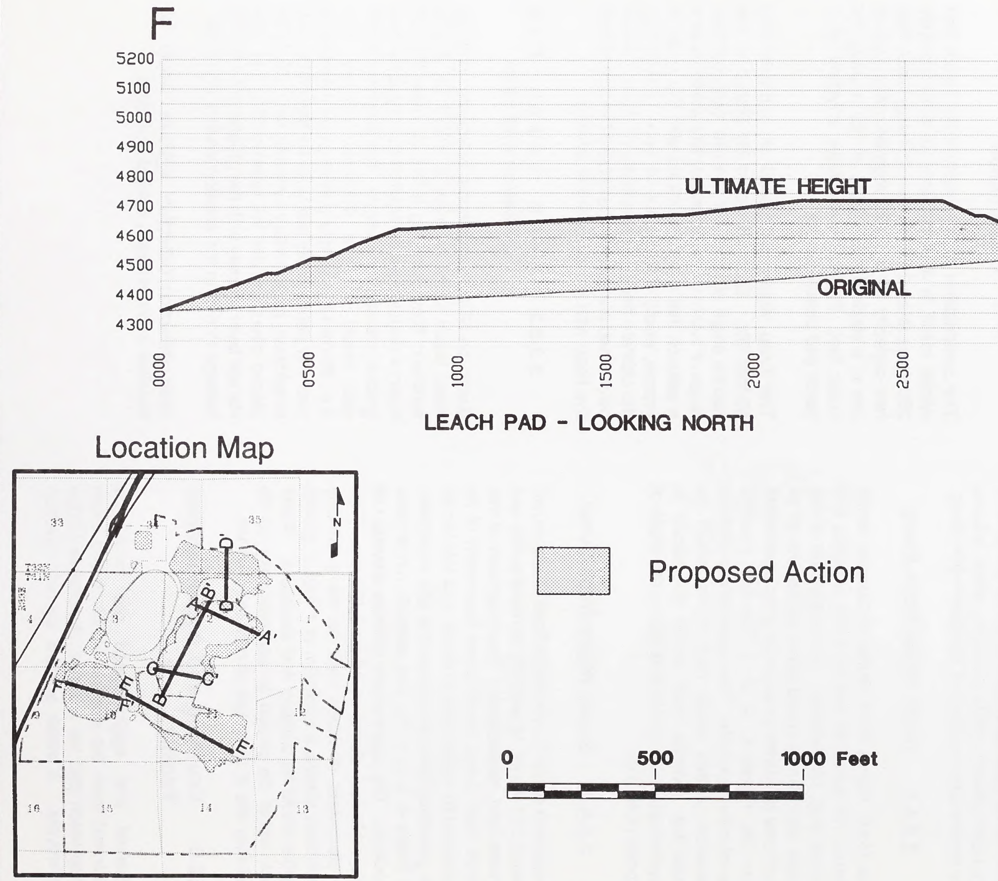
The construction of the South Heap Leach Pad would result in a disturbance of approximately 203 acres (Map 2-2). The South Heap Leach Pad has capacity for approximately 64 million tons of ore at a stacked unit weight of 100 pounds per cubic foot. Figure 2-4 illustrates a typical heap leach pad cross-section.

The heap would be loaded in approximately 30-foot lifts. Each lift would be placed at the natural angle of repose of the ore (approximate slope of 1.4H:1V). Subsequent lifts would require a setback that when combined with the angle of repose, would yield an overall slope of 3H:1V for the ultimate heap. The majority of the ore would be crushed and agglomerated and then placed on the heap with a radial stacker system.

2.2.6.2 Heap Leach Pad Foundation and Liner

Based on NDEP regulations, adequate lining for heap leach pads includes a single or double synthetic liner overlying a low permeability soil layer; a double liner is required in areas that have greater potential for leakage. The proposed leach pad would have a synthetic primary liner (i.e., 80-mil high density polyethylene membrane) over low permeability soil layer for the entire pad. In addition, a secondary synthetic liner would be placed directly under the primary liner and over the soil layer in areas with the greater potential for leakage including the solution control corridors.

Leak detection/collection systems would be installed in the solution control corridors.



Florida Canyon Mine

Figure 2-4

Proposed Heap Leach Pad Cross-Section

The low permeability soil layer would be at least 1 foot thick and would achieve a hydraulic conductivity of 1×10^{-5} centimeters per second (cm/s) or lower. Adequate soil would be available from overburden areas that would be removed during mining operations. Approximately 400,000 to 500,000 cubic yards of soil would be required for leach pad construction. Results from laboratory testing of soil samples indicate that an acceptable hydraulic conductivity can achieved provided reasonable quality control is maintained during construction.

Areas that require a primary and secondary synthetic liner would have polyethylene geonet positioned between the primary and secondary liners. Geonet would be installed as a continuous layer and would direct any solution passing through the primary liner to the leak detection/collection sumps provided in each of the interior solution control corridors. Geonet also would be used in the pregnant and enrichment solution channels that would transport solution from the solution corridors to the solution ponds. The geonet would be continuous and connect to the leak detection system provided for the solution ponds.

2.2.6.3 Solution Collection System

Five-foot high berms, positioned in a general southeast-northwest alignment, would be constructed within the leach pad area and would be designed to separate the pad area into four solution control cells (Figure 2-5). This arrangement would facilitate operations by providing a means of separating pregnant and enrichment solutions.

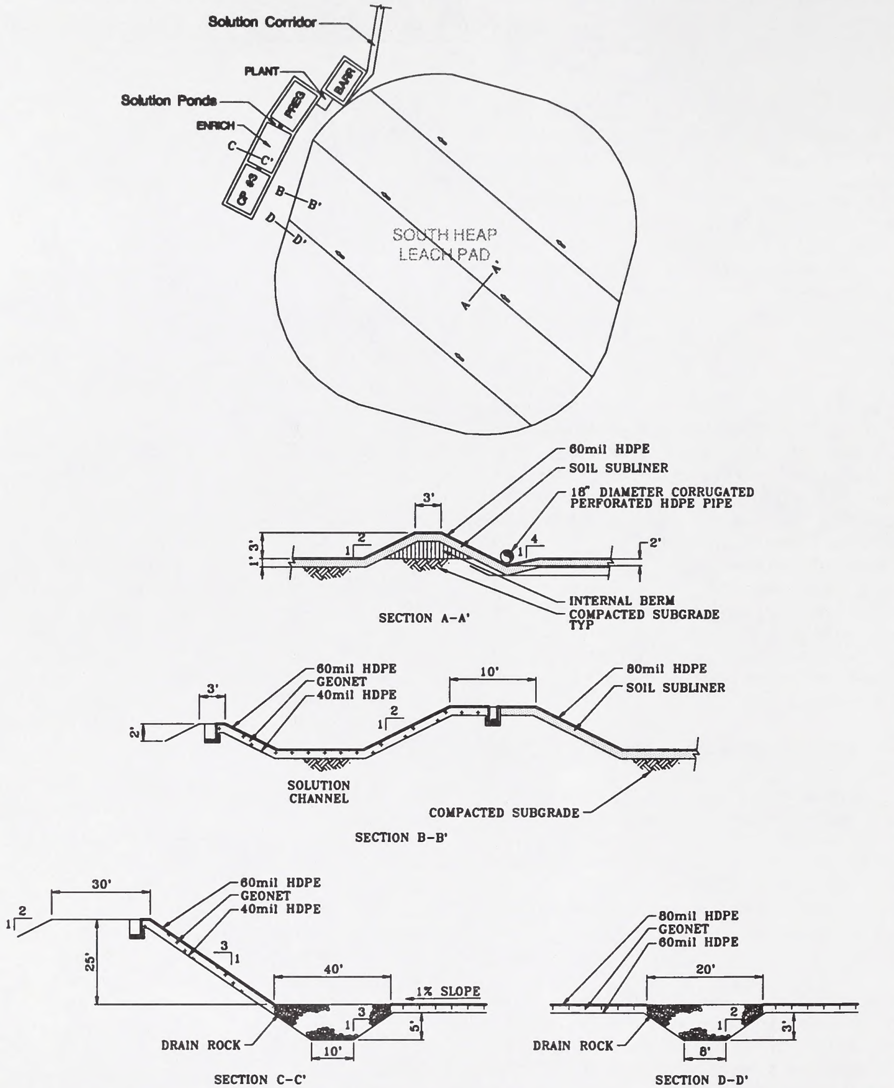
A solution transfer corridor with an associated 25-foot-wide road way, would connect the existing solution ponds to the new solution ponds via three continuous welded steel pipes. The solution corridor would extend a distance of approximately 3,000 feet from the proposed barren solution pond to an area near the existing barren and pregnant ponds. Two of the three pipelines would provide maximum solution flow rates of approximately 1,600 gallons per minute (gpm) from the proposed to the existing ponds. The third steel pipe would provide fresh water to the proposed ponds at approximately 1,600 gpm.

The total leach solution throughput would be 8,000 gpm (i.e., application rate of 0.004 to 0.005 gpm/ft^2). The solution collection pipeline network would consist of 4-inch, 8-inch, 12-inch, and 18-inch corrugated, perforated, high density polyethylene pipelines that would collect solutions and direct them into the 18-inch non-corrugated, non-perforated high density polyethylene pipeline that would ultimately direct the solution to the flumes and solution channels. The flumes are pre-fabricated steel channels that would allow the directing of solution into either the pregnant or enrichment solution channels. Similar devices are used in the existing operation.

The pregnant and enrichment solution channels would be 3 feet in depth and 10 feet in bottom width and would be conservatively designed to accommodate the total solution volume in addition to the runoff from the pad resulting from a 25-year, 24-hour (1.8-inch) storm event. As required by the NDEP. The combined flow rate of approximately 106,000 gpm would be routed within the channels with an estimated flow depth of 1.3 feet, leaving about 1.7 feet of freeboard. Fencing that meets the NDOW permit requirements would be installed around solution corridors, ponds, and overflow ponds to prevent access by wildlife and livestock.

2.2.6.4 Leak Detection

A leak detection system would be designed based on NDEP regulations (Figure 2-5). Areas where solution flows would be concentrated would be designed with a double liner system and a leak detection system equipped with leak detection/recovery sumps. This leak detection system would be designed to provide containment and collection of leaks through the primary liner in the solution channels and corridors. The double liner system within the pad would consist of 80-mil high density polyethylene membrane placed over geonet that would be placed over 60-mil high density polyethylene. The leak detection/recovery sumps would be located at the west end of the double-lined channels and where the pregnant and enrichment solution channels flow into the solution ponds.



Florida Canyon Mine

Figure 2-5

Cross-Section of the Solution Collection and Leak Detection System

Each of the solution ponds would be designed with full leak detection consisting of a double lined system equipped with a leak detection/recovery sump. The ponds would be designed with a 60-mil high density polyethylene membrane over geonet that would be placed over 40-mil high density polyethylene membrane. The pond bottoms would be sloped at 1 percent toward the lowest corner where the detection/recovery sump would be located.

2.2.7 South Adsorption Plant (Process Area)

The South Adsorption Plant is located within the process area as illustrated on Map 2-2.

2.2.7.1 Solution Processing

The adsorption plant would process gold-bearing pregnant solution at a rate of 4,500 gpm. Pregnant solution from the pad would be pumped to two set-of-five carbon columns, located in the process area, where gold would be extracted from solution. Barren solution would gravity drain to the barren pond for re-use in the heap leach circuit.

Cyanide solution from the barren solution pond would be pumped to a leach pad header pipe that would have both carbon steel and high density polyethylene sections. Branch lines from the main header would distribute the solution to emitters located on top of the heap on approximate 2-foot centers. Barren solution also may be applied to the heap by conventional sprinkler heads. Emitters or sprinklers would be assembled and operated to distribute solution at application rates from 0.0025 gpm/ft^2 to 0.005 gpm/ft^2.

2.2.7.2 Solution and Storm-Event Storage Ponds

Four solution ponds, constructed with a double liner system and an independent leak detection system, would be constructed for the South Heap Leach Pad (Map 2-2). The double liner system would consist of a 60-mil high density polyethylene membrane placed over geonet that would be placed over 40-mil high density polyethylene membrane. The leak detection system would consist of a 5-foot deep and 30- by 30-foot wide sump that would be backfilled with granular material between the two membranes. A 6-inch diameter high density polyethylene casing would provide access to the sump for leak detection/recovery.

The barren solution pond would be 200 feet by 325 feet at the crest with 3H:1V side slopes to a total depth of approximately 25 feet. The barren pond design storage capacity would be 6.2 million gallons. The pregnant and enrichment solution ponds and contingency pond would be 400 feet x 250 feet and would be constructed with 3H:1V side slopes and have a total depth of approximately 25 feet. Each of the 3 ponds would have a design storage capacity of 11 million gallons plus 2 feet of freeboard. The combined storage capacity for the 4 new ponds would be 39.2 million gallons with 2 feet of freeboard.

Solution applied to the heap would percolate through the ore on the heap and subsequently flow in a general east to west direction toward the solution ponds. Separation of the pregnant and enrichment solutions would be achieved by separate flume and channel systems for the pregnant and enrichment solutions. The pregnant and enrichment solutions channels flow along the lower perimeter of the leach pad until reaching the pad exit point. The solution channels would flow directly to the respective solution pond from the pad exit point. The pregnant and enrichment solution ponds would be designed with a spillway in their common berm that would allow these two solution ponds to reach their storage capacity prior to any solution flowing through the spillway to the contingency pond.

In the event the stand-alone barren solution pond would be filled to its storage capacity, an overflow outlet would direct excess solution to the other solution ponds.

2.2.8 Storm Water Control

Runoff from upslope of the mine would be prevented from contacting mine ore and waste rock by diversions in five drainage channels around mine operations. Runoff from the North and South Waste Rock Dumps is captured and diverted to sediment ponds for detention. Water entering the sediment ponds would evaporate or infiltrate into valley sediments.

The Wiley Gulch Diversion that currently prevents run-on of precipitation onto the South Waste Rock Dump would be realigned as would the Johnson Canyon Drainage. Drainage from Wiley Gulch Diversion would be directed to the South Sediment Pond, as illustrated on Map 2-2.

The Johnson Canyon Diversion would route storm water around the South Heap Leach Pad. Storm water in this diversion would discharge into an existing drainage and infiltrate into the alluvial materials in the valley.

A channel would be constructed to re-establish the Florida Canyon Drainage. Water flowing down Florida Canyon during a storm event would flow over a bedrock drop 225 vertical feet. The flow would then traverse on a 5 percent slope through the proposed channel over the backfilled portion of the pit. The riprapped channel would then traverse through a portion of the south waste rock dump. After emerging from the waste rock dump, the channel with 3H:1V side slopes would continue to the west to converge with the Wiley Gulch Diversion channel. The combined channels would then flow to the South Sediment Pond.

Two additional diversions would route storm water around the north and south sides of the North Waste Rock Dump and enter a sediment pond to the northwest of the site.

The proposed diversion channels and the sediment ponds have been designed to withstand a 100-year, 24-hour precipitation event with enough freeboard to hold a 300-year, 24-hour precipitation event (Figures 2-6 and 2-7).

2.2.9 Water Supply

Water needs at the mine are approximately 500 to 600 million gallons annually. The total water use in 1996 was about 450 million gallons. Total water use in 1997 for existing operations is expected to be about 577 million gallons. Water would be used for processing, reclamation, and dust suppression.

2.2.9.1 Surface Water

When available, up to 2,000 acre-feet of water is purchased from the Pershing County Water District. The water is pumped from the Lower Pitt Taylor Reservoir via an underground pipeline (N-61165) that parallels the access road to the reservoir. The pipeline passes under the Southern Pacific Transportation Company's railroad and under I-80 and to the mine site.

2.2.9.2 Subsurface Water

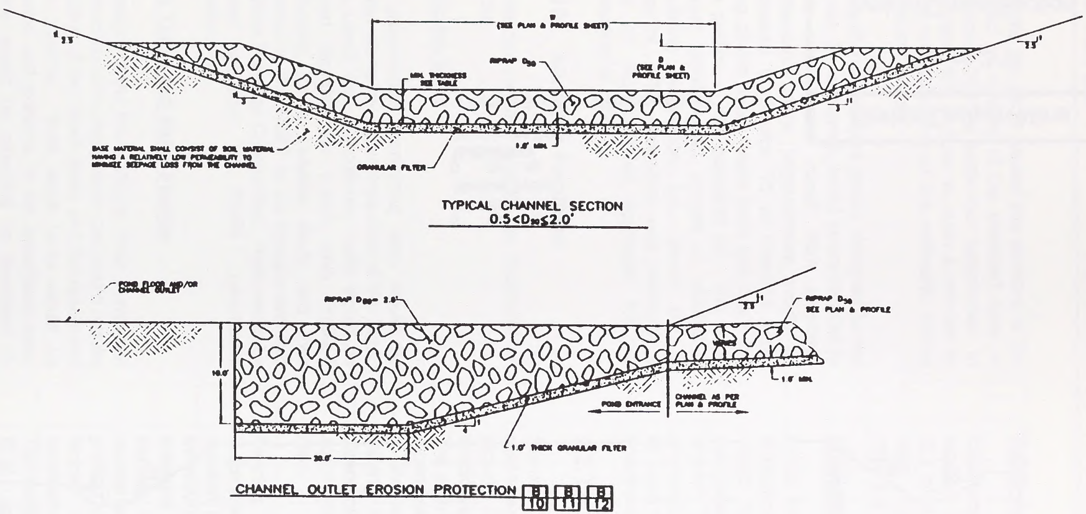
If water is not available from the Pershing County Water District (such as during a drought), the primary source of water would come from five production wells. The five wells are completed at depth into the lower geothermal aquifer. This geothermal water is too brackish to be used for agricultural purposes. The Nevada Division of Water Resources (NDWR) has authorized a combined usage of up to 787 million gallons per year from the wells.

A public water supply for human consumption is provided from a well completed in the water table aquifer, which supplies the offices and truck shop.

2.2.9.3 Sediment Ponds

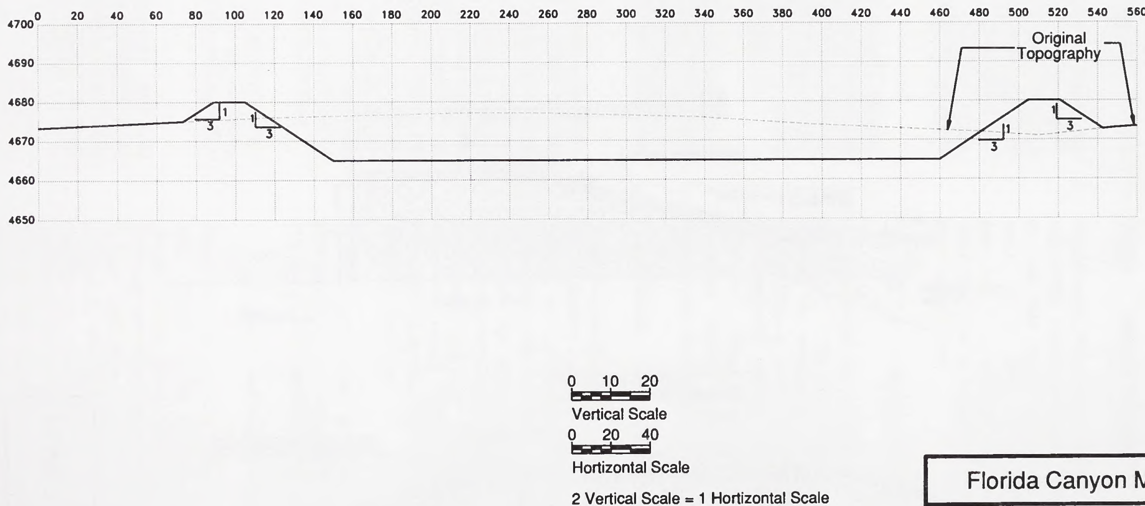
There are currently four sediment ponds at the site. These ponds are located at strategic locations to intercept runoff from storm events. The sediment laden water is captured to prevent it from discharging off of the property. This method of capture allows the storm water to escape by infiltration or evaporation. The sediments are left behind and cleaned out every 3 to 5 years to regain the maximum storage capacity of the impoundments. The excavated

RIPRAP D_{50}	MIN. THICKNESS
2.0	4.0'
1.5	3.0'
1.0	2.0'
0.75	1.5'
0.5	1.0'



FLORIDA CANYON MINE

FIGURE 2-6
TYPICAL CHANNEL SECTION AND OUTLET EROSION PROTECTION



Florida Canyon Mine

Figure 2-7

Typical Cross-Section of Sediment Pond

sediments are either hauled into portions of the backfilled pit outside of the saturated zone or incorporated into the waste rock repositories. In either case, this is done in such a manner to prevent re-mobilization of the sediments during future storm events.

Two additional sediment ponds, designed for the 100-year, 24-hour event, would be constructed to collect storm water runoff from proposed disturbances. One impoundment would be constructed in Section 10 to intercept water flowing off the South Waste Rock Dump and the south portion of the backfilled pit. The other sediment pond would consist of utilizing a pre-existing excavation (i.e., gravel pit) in Section 34. This excavation was previously a gravel pit that supplied aggregate for the construction of I-80.

2.2.10 Ancillary Facilities

The various ancillary facilities are illustrated on Map 2-2.

Monitoring Wells

Five groundwater monitoring wells would be installed along the downslope side of the South Heap Leach Pad. Monitoring wells would be sampled monthly for 1 year, with Profile II parameters, for a baseline study and then submitted to the NDEP to be incorporated into the Water Pollution Control Plan. Wells would be sampled quarterly for Profile I parameters thereafter.

Stock Tanks and Water Pipeline

Expansion of the North Waste Rock Dump and construction of the heap leach pad would require relocation of two stock tanks and the associated water pipeline. Both stock tanks would be relocated and portions of the associated water pipeline would be relocated as illustrated on Map 2-2.

Public Access Road

Expansion of the South Waste Rock Dump would require realignment of the western portion (2.1 miles) of the Johnson Canyon public access road. This road would be 20 feet wide and require 5 acres of disturbance.

Substation and Powerline

Power for the heap leach pad would require a substation and powerline. The size of the facility would be determined when the design is completed for the leach plant facility and the crusher. This facility would be located west of the proposed South Heap Leach Pad. Construction of these facilities would occur concurrently with construction of the south adsorption plant.

2.2.11 Security and Fencing

Security in the project area would be the responsibility of FCMI. The security system would include direct security measures, supported by employees involved in the day-to-day operation. The active mining area would be surrounded by a perimeter fence, except along the steep terrain to the east of the pit. Persons entering and leaving the area would be required to gain clearance through a gate located near the administration building along the main access road.

Fencing that meets the NDOW permit requirements would be installed around the solution ponds, solution channels, and solution overflow ponds to prevent access by wildlife and livestock. The area of operations would be partially enclosed with a BLM-approved range control fence (4-strand barbed wire). The eastern portion of the permit boundary would not be fenced due to the steep terrain, which is considered inaccessible to domestic livestock. The range control fence may be relocated, with BLM approval, depending on operational conditions. Any monitoring wells located outside the fenced area would be clearly marked and locked. Additional fences or controls would be installed as necessary.

2.2.12 Exploration Drilling Sites and Roads

Exploration drilling activities would include a shallow drilling program. The objectives of the shallow drilling program would be to identify new ore reserves and to provide support data for short- and long-term mine planning. Shallow drilling depths range from 200 to 1,000 feet. A 200-foot depth would be typical of a hole drilled in an active pit to provide data for short- and long-term mine planning, while a 1,000-foot depth would be typical for identifying new ore reserves in the higher elevation terrain east of the existing pits.

Drill pads would be typically level with dimensions of 50 feet wide by 80 feet long. Drill roads would be approximately 24 feet wide with an operating width of 16 feet. Drilling activities would disturb 75 acres of which 21 and 54 acres would be disturbed by drill pad and road construction activities, respectively. Existing roads would be used, where possible, to minimize new disturbance. New roads would only be constructed when existing roads would not provide safe, efficient access.

Prior to construction of the drill pads and roads, surface soil would be stripped and stockpiled for use during reclamation of the disturbances. Each drill pad would be constructed with two mud pits; one for settling of the drill cuttings and one for settling of the mud solids. A berm would be constructed on the downhill side of each drill pad to provide containment and prevent runoff from the drill pad area.

2.2.13 Hazardous Materials and Wastes

2.2.13.1 Reagent Transportation and Storage

The existing program for the management of hazardous materials would be maintained. Any wastes generated that are classified as hazardous would be managed in accordance with prevailing regulations and guidelines. Information and permits pertaining to the management of hazardous materials, use, and storage are provided in Table 2-3.

Liquid waste streams from the assay laboratory are neutralized and recycled back into the processing circuit. Assay sample pulps and column test waste ores are placed on the heap leach pad. Laboratory slag, cupels, and crucibles are sent to off-site smelters where they are used as flux material. Fire assay slag also is sent off-site to reclaim the metal values in it. Similarly, all used petroleum products and antifreeze are transported off-site to recycling facilities. Non-ticturn (i.e., tin free) oil filters are utilized throughout the site. In accordance with current U.S. Environmental Protection Agency (USEPA) regulations, used oil filters are hot drained for 24 hours, crushed, and then discarded in the Class III landfill located within the South Waste Rock Dump. All hazardous wastes are sorted, packaged, and manifested in compliance with applicable state and Federal regulations.

2.2.13.2 Spill Prevention and Emergency Response

Of the chemicals needed to implement the Proposed Action, sodium cyanide, sodium hydroxide, hydrochloric acid, and calcium hypochlorite are hazardous substances that are listed in 40 CFR 302.4 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (including The Emergency Planning and Community Right-to-Know Act), and the hazardous substances appendices of the Superfund Amendments and Reauthorization Act (SARA). The CERCLA creates a framework for Federal response to hazardous substance releases. For purposes of emergency response planning under the SARA, Title III, a threshold planning quantity is established for each hazardous substance. The threshold planning quantity and reportable quantity values for sodium cyanide and sodium hydroxide are 10 pounds and 1,000 pounds, respectively, the reportable quantity value for hydrochloric acid is 5,000 pounds; calcium hypochlorite 10 pounds; ethylene glycol/coolant 25 gallons; and petroleum products 100 gallons. Petroleum products are excluded as hazardous substances under CERCLA Section 101(14), but are addressed in

Table 2-3

Hazardous Materials Summary

Material	Use	Rate of Use	Amount Stored (typical)	Storage Method	Waste Management/ Disposal	Use Location	Hazard Characteristic	Amount per Load
Sodium Hypochlorite	Spill Clean-up	NA	165 gal	Polyethylene Drums	Spent	Spill location	Corrosive	165 gal
Hydrochloric acid	Process	3,000 lbs/year	3,000 lbs	Polyethylene Tank	Spent	Process Facility	Corrosive	252 lbs
Lime (calcium oxide)	Process	27,375 tons/year	105 tons	Steel Silo	Spent	Process Facility	Corrosive	25 Tons
Portland cement	Process	27,375 tons/year	140 tons	Steel Silo	Spent	Process Facility	Corrosive	25 Tons
Sodium cyanide (solution)	Process	2,160 tons/year	81 Tons	Steel Tank	Spent	Process Facility	Poison	9 Tons
Sodium Hydroxide (solution)	Process	180 tons/year	48 Tons	Plastic Barrels	Spent	Process Facility	Corrosive	15 Tons
Zinc	Process	66 tons/year	20 Tons	Steel Buckets	Spent	Process Facility	Poison	11 Tons
Acetylene	Mine	1,820 cubic feet		Pressure Cylinders	Spent	Truck Shop	Explosive	35 cylinders
Oxygen	Mine	1,820 cubic feet		Pressure Cylinders	Spent	Truck Shop	Explosive	35 cylinders
Diesel Fuel	Mine	2,800,000 gal/yr	60,000 gal	Steel Tank	Spent	Truck Shop	Flammable	11,500 gal
Gasoline	Mine	144,000 gal/yr	12,000 gal	Steel Tank	Spent	Truck Shop	Flammable	3,000 gal
Propane	Mine	180,000 gal/yr	31,050 gal	Pressurized Steel Tank	Spent	Office, Lab, Truck Shop, Process Facility	Flammable	15,000 gal
Ethylene Glycol	Mine	3,300 gal/yr	14,000 gal	Steel Tank	Recycled	Truck Shop	Poison	275 gal
Ammonium Nitrate	Mine	7,020 tons/yr	45 tons	Steel Silo	Spent	Mine	Explosive	45 tons
Class A Explosive	Mine	12 tons/year	2 tons	Magazine	Spent	Mine	Explosive	2 tons
Fluxes/Reagents	Lab/Refine	1 ton/year	1,000 lbs	Various	Spent	Laboratory	Poison	100 lbs

the *Spill Prevention, Control, and Countermeasures Plan*.

The Emergency Planning and Community Right-to-Know Act is a subpart of the SARA, Title III. As mentioned above, the Emergency Planning and Community Right-to-Know Act primarily designates threshold planning quantities and reportable quantities for regulated hazardous materials. However, based on these quantities, the Emergency Planning and Community Right-to-Know Act also specifies the following:

- Emergency Response Plan requirements for those facilities with materials stored on-site in quantities greater than the threshold planning quantities;
- Hazardous material reporting requirements;
- Notification requirements based on the reportable quantities;
- All reporting, notification, and other plans supplied to the local, state or Federal authorities under Emergency Planning and Community Right-to-Know Act shall be made available to the public; and
- Provides guidelines for citizen awards for information on criminal violations of the CERCLA.

Information would be voluntarily provided to the Lovelock Local Emergency Planning Commission, the Pershing County Volunteer Fire Department (Grass Valley, Lovelock, and Imlay), and Lovelock Emergency Medical Service. Hazardous materials on-site would be provided in an annual State Fire Marshals report.

The U.S. Department of Transportation (USDOT) has developed a list of materials that are classified as hazardous for transportation purposes (49 CFR 172.101) and prescribes packaging and labeling requirements for each designated hazardous material. The USDOT hazardous materials list includes the hazardous substances regulated under CERCLA, as well as other types of chemicals. In addition to the hazardous substances described above, transportation of sodium hydroxide, ammonium nitrate, Class A explosives, diesel fuel, cement, and calcium oxide (lime) must comply with USDOT hazardous materials packaging and labeling requirements.

FCMI has developed a fluid management plan (operating plan per Nevada Administrative Code [NAC] 445A.398) that describes the capabilities of the fluid containment systems to accommodate unusual natural or operational events to prevent fluid losses from containment areas. The plan also discusses monitoring capabilities to detect leaks from the leach pad. FCMI also has developed an *Emergency Response Plan* for the Proposed Action, which is contained in the Plan of Operations. This plan describes the system that would be used for the prevention, response, containment, and safe cleanup of all spills or discharges that may potentially degrade the environment. Also included are procedures to be followed after seismic events, floods, and fires.

The Emergency Response Plan identifies the spill discovery, notification, and general cleanup procedures in the event of a release or spill from any component of their respective fluid management system. The fluid management system includes: the process recovery system, piping, pumping, ditches, and other items used in the management and fluid containment of the leaching and processing facilities. The plan also would apply to spills of stored chemicals and petroleum products. All chemicals would be stored and handled in accordance with manufacturer's recommendations and state regulations.

The procedures outlined in this plan apply to leaks and spills from mine operations and exploration activities.

The material safety data sheets for all the chemicals used on the mine site would be kept at locations that are accessible to the working personnel.

The person discovering a chemical spill or an accidental discharge from any component of the fluid management system would immediately shut down that portion of the failed system to eliminate further discharge. That person would then notify their immediate supervisor. The appropriate procedure would be followed based on the time

of the event, including other proper notifications of mine personnel, as identified in the Spill Response Plan.

A reportable release or spill from the fluid management system would be considered an event that is not in compliance with FCMI's Water Pollution Control Permit. The Environmental Manager would be responsible for reporting all reportable spills to BLM, the USEPA, and the NDEP Bureau of Corrective Actions. A release from the fluid management system would be reported orally to the NDEP, as soon as possible, but no later than the end of the first working day after knowledge of the release. A written summary also would be provided to the NDEP within 10 days of the oral notification. The written summary would contain a description of the release and its cause; the periods of release (including exact times and dates); whether the cause of the release has been corrected, and if not, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the release.

2.2.13.3 Waste Management

All lavatory wastes are disposed of into septic systems located at the plant and office site, crusher shop, and equipment/maintenance areas.

Non-hazardous solid waste generated at the Florida Canyon Mine would be disposed in an approved Class III landfill located within the South Waste Rock Dump in accordance with state and Federal regulations. No hazardous wastes, liquid wastes, or petroleum products would be disposed in the landfill. The landfill would be inspected on a weekly basis to ensure that no hazardous materials or waste are deposited in the landfill.

2.2.14 Environmental Protection Measures and Monitoring

Environmental monitoring for the Proposed Action would include storm water discharge, production wells, groundwater monitoring wells, process solutions, leak detection and recovery, rock characterization, and wildlife protection.

2.2.14.1 Water Management and Sediment Control

<u>Storm Water Discharge</u>

Samples would be collected from drainages exiting the permit boundary from areas of exposed overburden materials and analyzed for the effluent parameters listed on 40 CFR 440.104(d)(1). This data would be reported to the NDEP Bureau of Water Pollution Control once per year.

<u>Groundwater Monitoring</u>

Groundwater levels would be monitored on a monthly basis as required by NDWR. This data would be used to validate the groundwater model annually.

<u>Production Wells</u>

Production wells 1, 2, 3, 6, and 7 pump into a cooling pond prior to the water being brought into the processing system. A composite sample is collected once per year from the cooling pond for NDEP Profile #I parameters. Production Well 4 (PW-4) and a temporary sump are located in the Phase 4 Pit. PW-4 pumps water directly to the Merrill Crowe Plant or cooling pond. Water in the temporary sump is pumped to the water storage tanks southwest of the existing crusher. Production well 4 is sampled on an annual basis for NDEP Profile #I parameters. Data is reported once per year to NDEP Bureau of Mining Regulation and Reclamation. Static water levels and quantities are reported monthly to the Department of Water Resources.

2.2.14.2 Acid Rock Drainage

At least eight waste rock samples (11 kilograms [kg]) would be collected quarterly during mining operations. These samples would be sealed in plastic bags and subsequently analyzed using the meteoric water mobility procedure according to the NDEP Bureau of Mining Regulation and Reclamation standards. In addition, these samples would be analyzed for acid-base accounting (i.e., static tests). Static test data would be supplied to the NDEP and BLM. If

static test results exceed the NDEP and the BLM criteria, then kinetic testing (humidity cell tests) would be performed. The quarterly test results would be provided to the NDEP and the BLM.

2.2.14.3 Special Waste Rock Management

A geochemical site characterization conducted by Shepherd Miller, Inc. (SMI 1997) indicated that a small portion of the waste rock to be produced by FCMI (0.2 percent) may have a moderate potential to generate acidic drainage. The potentially reactive waste rock consists of a small amount (about 400,000 tons) of sulfide material. Assuming an additional amount of transitional material may be present, FCMI has estimated that about 500,000 tons of waste rock would be classified as potentially reactive, or "non-oxide," and would require special management to reduce the likelihood of acid formation.

Non-oxide waste would be segregated from oxide (non-reactive) waste and placed within each of the two waste rock dumps in the locations shown on Map 2-3. The non-oxide cells within the waste rock are designed to isolate potentially reactive waste rock from water, air, and the plant root zone and to prevent unrestricted infiltration of surface water through potentially reactive waste. The cells would be positioned on topographic highs between existing drainage channels to minimize accumulation of subsurface water within the cell. Waste rock surfaces would be graded to a minimum slope of 3 percent away from the reclaimed dump crest towards the existing ground surface to promote runoff of direct precipitation. Diversion channels, already included as part of the Proposed Action, would prevent run-on of storm water from the adjacent ground surface. Non-oxide cells would be constructed by end-dumping non-oxide material between 50-foot lifts of oxide material. A typical cross-section of a waste rock dump showing the proposed location of the non-oxide cells is shown in Figure 2-8. The dump surfaces would be reclaimed with a minimum thickness of 1 foot of alluvial cover to provide a suitable rooting medium and to provide a low permeability cap for the cell.

2.2.14.4 Spill Prevention Sampling

<u>Monitoring Wells</u>

Five additional monitoring wells would be established along the western edge of the South Heap Leach Pad. The five monitoring wells (wells 18 through 22) would be sampled monthly for the first year and tested for the NDEP Profile II parameters. Information regarding these monitoring wells would be submitted monthly to the NDEP for inclusion into the Water Pollution Control Permit.

<u>Process Solutions</u>

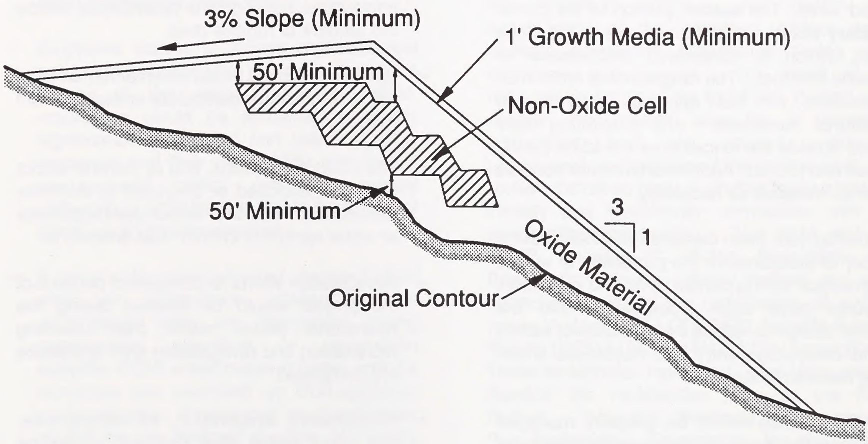
The barren and pregnant leach solutions are sampled semi-annually for the NDEP Profile II parameters. The samples are collected in the plant and data is reported semi-annually. Barren and pregnant process solution analyses associated with the South Heap Leach Pad would be submitted to the NDEP for inclusion in the Water Pollution Control Permit.

<u>Leak Detection</u>

All leak detection sites shown would be checked weekly. If an accumulation of liquid appears, action would be taken to determine the source and make repairs. Data would be reported quarterly. All new leak detection systems associated with the South Heap Leach Pad would be submitted to the NDEP for inclusion in the Water Pollution Control Permit.

2.2.14.5 Stability of Facilities

Facilities including the waste rock dumps and the heap leach pad would be designed to be stable during operations and following project closure. Stability modeling results for the heap leach pad and the waste rock dump would be contained in the application for the NDEP Bureau of Mining Regulation and Reclamation Permits. Results of the heap leach pad and waste rock dump stability modeling also would be contained in the Amended Plan of Operations. In addition, these facilities would be visually monitored on a regular



Florida Canyon Mine

Figure 2-8

Typical Cross-Section of the "Non-Oxide" Cells

basis during operations to identify any visible stability problems.

2.2.14.6 Wildlife and Livestock Protection

Fencing that meets the NDOW permit requirements would be installed around the solution ponds and solution overflow ponds to prevent access by wildlife and livestock. The area of operations would be partially enclosed with a BLM-approved range control fence (4-strand barbed wire). The eastern portion of the permit boundary would not be fenced due to the steep terrain, which is considered inaccessible to domestic livestock. The range control fence may be relocated, with BLM approval, depending on operational conditions. Any monitoring wells located outside the fenced area would be clearly marked and locked. Additional fences or controls would be installed as necessary.

The project has been designed to incorporate a number of measures for the protection of wildlife and livestock during construction and operation. Measures have been incorporated into the facilities' design to reduce the attraction of wildlife and to discourage entry into hazardous areas. These features include:

- Project waste would be properly managed and the site monitored to control garbage that could attract wildlife.
- Power transmission and distribution line towers constructed to service the proposed facilities would be designed to avoid raptor electrocutions.
- Solution channels and ponds would be covered with netting to minimize bird and bat mortality.
- Any Wildlife mortalities observed within the project area would be verbally reported to the NDOW by the beginning of the next working day after making the observation. Quarterly wildlife mortality reports would be submitted to the NDOW.

2.2.14.7 Air Quality

FCMI would incorporate the following measures into the project design to control the generation of PM_{10} particulates.

- Water or surface binding agents would be applied to haul and access roads within the site boundary as needed. Dust control measures, including watering, chemical stabilization, and other controls approved by the Nevada Bureau of Air Quality, would be implemented during mine operation to reduce the amount of fugitive dust.
- Speed restrictions would be enforced on mine roads to minimize particulate emissions from roadways.
- The crushers, screens, and all transfer points would be enclosed or shrouded to minimize exposure to wind and would use baghouses or water sprays to control dust emissions.
- Revegetation efforts for completed portions of the project would be initiated during the operational period rather than deferring reclamation and revegetation until operations are completed.
- Precipitation, evaporation, air temperature, and wind speed and direction would be recorded continually at the mine's weather station. The computerized data would be collected every month with the exception of precipitation that is collected weekly and evaporation that is recorded manually every 2 or 3 days.

2.2.14.8 Cultural Resources and Paleontology

The following environmental protection measures have been incorporated into FCMI's project design to prevent and reduce potential impacts to cultural and paleontological resources within the project area.

- Mine permit boundary markers consisting of metal fence posts painted orange would be placed along the eastern boundary of the

permit area. Posts would be clearly visible from one point to the next from either direction. Mine exploration and operations equipment use would be prohibited beyond the boundary line.

- Secondary effects to eligible sites resulting from road and drill pad construction and use would be minimized through the implementation of erosion control measures, as necessary, such as the use of road design, double sumps for drill water, water bars, and other appropriate measures.

- Employee access to known archaeological and paleontological sites on private land in the vicinity of the mine would be limited, employees would be educated as to the significance of cultural and paleontological resources and their vulnerability, and a strict management policy restricting casual collecting of artifacts and fossils from project lands would be implemented.

- If previously undocumented archaeological sites or subsurface components of documented sites are discovered during construction, operation, or reclamation activities, FCMI would cease activities until the resources are examined by BLM-approved archaeologists. If resources are identified as eligible for the National Register of Historic Places (NRHP), impacts would be mitigated through an appropriate treatment plan approved by the BLM, the State Historic Preservation Officer (SHPO), FCMI, and the Advisory Council, or through site avoidance.

- If significant fossiliferous deposits, specifically vertebrate fossil deposits, are located during exploration, construction, operation, or reclamation of the mine, paleontologists from the appropriate state or Federal agency would be immediately contacted and measures would be taken to identify and preserve or avoid the fossils.

- FCMI provides basic educational information and training and annual refresher training to its employees regarding the protected nature of cultural resources and enforces a strict management policy against causal collecting on mine property. This policy would be continued under the Proposed Action.

2.2.15 Reclamation

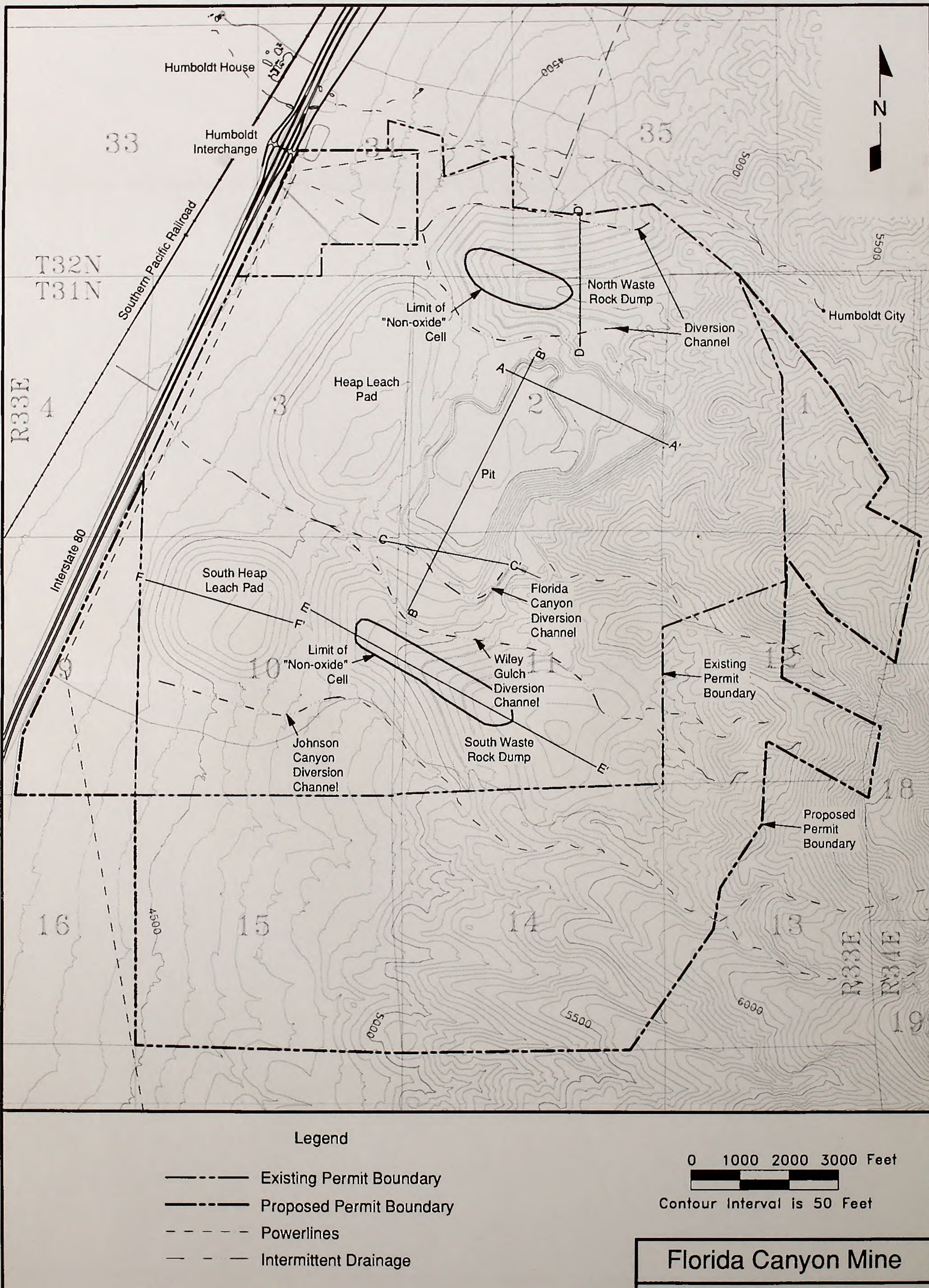
The comprehensive reclamation approach and procedures outlined in the Amended Plan of Operations #10 were developed for the site-specific conditions found at the Florida Canyon Mine, and address all mining-related disturbance. This includes disturbance authorized previously by BLM as well as that associated with the Proposed Action. The design and construction of the proposed project would facilitate concurrent reclamation during mine operations and closure. The intent of the reclamation program for the FCMI Project is to restore the project area to a beneficial post-mining land use, prevent undue or unnecessary degradation of the environment, and reclaim disturbed areas such that these areas are visually and functionally compatible with the surrounding topography. The BLM and the NDEP, Bureau of Mining Regulation and Reclamation are the primary Federal and state agencies regulating the reclamation of surface mines in Nevada (43 CFR 3809, Nevada Revised Statute [NRS] 519A, and NAC 519A, respectively). These reclamation regulations have been used to develop the reclamation plan for the FCMI Project. Map 2-3 illustrates the proposed Post-Reclamation Topography for the project area. The cross-sections are depicted on Figures 2-2, 2-3, and 2-4. As allowed by the existing Memorandum of Understanding between the State of Nevada and the BLM, the BLM would be the lead regulatory agency with responsibility for overseeing project reclamation.

2.2.15.1 Reclamation Goals

The reclamation procedures proposed for the FCMI Project incorporate five basic components:

- Establishment of stable surface and drainage conditions that control erosion;

- Utilization of proper growth media management techniques, including stripping, stockpiling, and possible reapplication of soil,



Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 2-3

Post-Mining Reclamation Topography Proposed Action

to establish surface conditions that would enhance regeneration of a plant community;

- Revegetation of disturbed areas, excluding the pit highwalls, using plant species adapted to site conditions in order to establish a long-term productive biotic plant community compatible with proposed future land uses;
- Consideration of public safety through the stabilization, removal, fencing, or berming of structures or landforms that could constitute a public hazard; and
- Establishment of post-reclamation topography compatible with the surrounding landscape.

2.2.15.2 Growth Media Stockpiling

All suitable growth media located in proposed disturbance areas would be salvaged and stockpiled in the proposed North and South Growth Media Stockpiles (Map 2-2), unless used immediately in concurrent reclamation. Growth media stockpiles would be seeded with a BLM-approved seed mix to reduce potential erosion during mine operation.

2.2.15.3 Grading and Stabilization

Following construction activity, interim and concurrent reclamation of cut and fill slopes and borrow areas would be conducted. This may include placement of growth media and seeding in areas that would not be redisturbed and interim seeding in areas that would be redisturbed in the future. During operations, disturbances would be concurrently reclaimed as soon as practical to reduce visual impacts.

Contouring would consist of grading and sloping; scarification or ripping; and growth media haulage and application. Contouring would be completed for the following facilities:

- Mine roads, including haul and service roads;
- Pit floors;
- Ponds;
- Heap leach facilities;
- Waste rock dumps;
- Growth media stockpiles; and
- Ancillary facilities.

All FCMI facilities, with the exception of the pit highwalls, having slopes steeper than 3H:1V would be reduced to a minimum 3H:1V during final reclamation.

2.2.15.4 Surface and Seedbed Preparation

Upon completion of final construction, the disturbed areas would be inspected for slope stability, relief, topographic diversity, acceptable surface water drainage capabilities, and compaction, where appropriate. Prior to growth media application and revegetation, scarification (i.e., ripping) would be performed on all compacted soil areas including roads and ancillary facilities. Compacted soils would be ripped to a depth of 18 inches. Growth media would then be placed on these roughened surfaces to a depth of 1 foot. The final reclaimed surfaces would be cross-scarified as needed to maximize water retention and to minimize erosion, and to prepare the final seedbed.

2.2.15.5 Seeding Mixtures and Rates

Vegetation sampling was conducted in 1995 to evaluate reclamation success within reclaimed waste rock dump areas which had been reclaimed for 2 to 3 years (SWCA 1995). Results from these field evaluations indicated that average plant cover in reclaimed areas (34.4 percent) was higher than reference areas (28.1 percent) located in adjacent, undisturbed plant communities. However, the majority of the plant cover was provided by introduced, weedy forb and grass species. Shrub cover (20 percent) observed in 1 of the 4 reclaimed areas exceeded shrub cover observed in one of the reference areas (14.2 percent).

Desirable plant species that were successfully established in the reclamation areas (3 shrubs and 1 grass) have been included in the seed mix for the proposed expansion area (Table 2-4).

Seeding would be accomplished by broadcasting. A preliminary seed mix is presented in Table 2-4; and is designed to optimize the forage potential of the lower elevation sites and is designed to

Table 2-4

Proposed Seed Mixture[1]

Scientific Name	Common Name/Variety	Seeding Rate (PLS lb/acre)[2]
Grasses		
Elymus junceus[3]	Russian wildrye/Bozoiski	2
Oryzyopsis hymenoides[4]	Indian ricegrass/Nezpar	2
Forbs		
Melilotus officinalis[3]	Yellow sweetclover	1
Penstemon palmeri	Palmer penstemon/NA	1
Shrubs		
Atriplex canescens[4]	Fourwing saltbush/NA	2.5
Ceratoides lanata[4]	Winterfat/NA	1
Atriplex confertifolia[4]	Shadscale/NA	4
Total		13.5

[1]Certified weed-free seed would be used.

[2]PLS - Pure live seed (pounds per acre).

[3]Introduced species.

[4]Species that have been successfully established in reclaimed areas at the mine.

NA = Not applicable.

stabilize and improve the forage potential of all disturbed areas.

2.2.15.6 Weed Control

During vegetation establishment, weed control practices would be implemented to limit the growth and spread of noxious weeds, and to ensure that revegetation is successful with the proposed seed mixtures. FCMI would work with the Nevada Department of Agriculture and the BLM, as appropriate, to minimize the spread of noxious weeds throughout the project area. In addition, any noxious weeds discovered on the site would be reported and an eradication plan would be developed with the BLM.

2.2.15.7 Reclamation Scheduling

Concurrent reclamation would begin in 1998 and continue until mine closure, at which point post-mining reclamation would begin. Reclamation activities at each phase of mine development would be timed to take advantage of optimal climatic conditions. Reclamation activities also would be scheduled to occur as soon as possible after the mining activities in a particular area are completed, thus minimizing erosion and sedimentation problems. General scheduling procedures to be followed include:

- Grading and drainage control establishment and maintenance would be conducted year-round;
- Seedbeds would be prepared in early fall just prior to seeding; and
- Seeding would be completed between October and December in order to take advantage of winter and spring moisture.

A schedule for concurrent reclamation of lands disturbed by the FCMI Project is presented in the amended Plan of Operations (FCMI 1996).

2.2.15.8 Facility Reclamation

Reclamation of proposed project facilities is discussed in the following sections. A summary of total disturbance, including existing and Proposed Action acreages, is presented in Table 2-5. A summary of reclamation acreages by project facility is presented in Table 2-6.

<u>Open Pit</u>

The objective of reclamation efforts for the mine pit would be to create a safe and stable topographic feature. Partial backfilling of the Phase 4 Pit area would raise the pit bottom to an average elevation of 4,675 feet to allow for the re-establishment of the Florida Canyon drainage channel. Partial backfilling of the Phase 5 Pit area would raise the bottom of the pit to the 4,450-foot elevation. Partial backfilling of the Phase 6 Pit would raise the bottom of the pit to the 4,650-foot elevation. All backfilled pit floors would be sloped to drain toward the alluvium highwall.

A total of 315 acres would be disturbed by pit development at the end of mining, of which 237 acres would be reclaimed. During the final phase of mining, waste rock would be hauled to construct a berm around the north, west, and south perimeters of the pit to ensure the safety of the public and terrestrial life, per NAC Chapter 513. Any roads leading to the eastern highwall also would be bermed near the pit to prevent access. These berms would be spread with growth media and seeded. Stabilization procedures for the closure of the pit would require leaving the highwall intact to eliminate any further disturbances.

<u>Waste Rock Dump Areas</u>

A total of 755 acres would be disturbed at the end of mining and would require reclamation. The waste rock dump areas would be constructed and reclaimed to blend into the surrounding topography to the extent practical. The waste rock dumps would be constructed in approximately 50- to 150-foot lifts by conventional end dumping methods. Waste rock dump construction methods are described in Section 2.1, Waste Rock Dumps. The angle of repose slopes would then be reduced to

Table 2-5

Total Acres of Disturbance After Proposed Action

Facility	Public Land	Private Land	Total
North Waste Rock Dump	185	97	282
South Waste Rock Dump	144	329	473
Existing Heap Leach Pad	57	264	321
South Heap Leach Pad	195	8	203
Crushers and Shops	68	45	113
Plant and Offices	0	31	31
Roads	47	33	80
Ponds	14	46	60
Pits	222	93	315
Water System and Wells	2	1	3
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads	149	73	222
Total Disturbance	1,083	1,036	2,119

Note: These acres calculated by summing acres from the BLM Table 1 - *Acres of Existing Disturbance* and Table 1-2 - *Acres of Proposed New Disturbance* from APO #10.

Table 2-6

Reclaimed Acres After Proposed Action

Facility	Public Land	Private Land	Total
North Waste Rock Dump	185	97	282
South Waste Rock Dump	144	329	473
Existing Heap Leach Pad	57	264	321
South Heap Leach Pad	195	8	203
Crushers and Shops[1]	32	25	57
Plant and Offices	9	97	106
Roads[2]	21	8	29
Ponds[3]	10	27	37
Pits[4]	151	86	237
Water System and Wells	2	1	3
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads[5]	144	58	203
Total Reclaimed	950	1,016	1,967

[1]Crusher A is taken out by pit expansion.

[2]Some road acreage is reclaimed with the leach pad(s), plant & offices, and pits. Johnson Canyon access road (5.2 acres) is not reclaimed.

[3]Some pond acreage is reclaimed with the plant & offices.

[4]Approximately 78 acres of the pit constitute highwall and therefore would not be reclaimed due to the lack of accessibility.

[5]Approximately 19.7 acres of exploration disturbance is taken out by pit expansion.

approximately 3H:1V undulating slopes to enhance revegetation, create a variety of wildlife microhabitats, minimize visual impact, and create a variable contour interval simulating surrounding topography. These recontoured slopes would be covered with a minimum of 1 foot of suitable plant growth media, then fertilized and seeded. Drainages would be maintained on or beside the dumps to collect runoff from the benches.

Reclamation activities would occur only during daylight hours.

Crusher and Agglomeration Facility

Buildings, process structures, and other equipment would be removed from the site at the end of mining in accordance with appropriate Federal and state regulations. Foundations would be buried in place prior to growth media application and revegetation. The sites would be revegetated with the seed mix listed in Table 2-4. Equipment, electrical and instrumentation, aboveground piping, miscellaneous fencing, and mobile trailers also would be removed from the site or returned to local vendors.

Heap Leach Facilities

Reclamation procedures for the heap leach facilities incorporate ore and solution characteristics, site conditions, and climatic conditions. The reclamation phases for the heap leach facility include:

- Heap rinsing;
- Heap contouring, growth media application, and revegetation;
- Rinse solution management; and
- Pond reclamation.

Detoxification of FCMI's heap leach facilities would be accomplished through natural degradation (volatilization) of cyanide and trace metal recovery by conventional Merrill-Crowe and/or carbon adsorption or other suitable technology.

Water for heap rinsing and detoxification would be pumped from Lower Pitt-Taylor Reservoir assuming that enough reservoir storage is available each year. If reservoir water is not available, shortfall would be supplied by the existing wells. This availability is based on annual precipitation and snow pack of upper drainage areas. If water from Lower Pitt-Taylor Reservoir is not available, rinse water would be obtained from the FCMI production well field. Since the water from Lower Pitt-Taylor Reservoir is cleaner than the brackish water available from the production wells, the rinse time is greatly reduced. In either case, approximately 2,000 acre-feet (1,240 gpm) of water would be applied for each year of required rinsing. The goal would be to rinse until:

- WAD cyanide levels in the effluent rinse water are less than 0.2 milligrams per liter (mg/l);
- The pH level of the effluent rinse water is between 6.0 and 9.0; and
- Contaminants in any of the effluent from the processed ore which would result from meteoric waters would not degrade waters of the state.

If reservoir water is used, the rinse time required for the north heap would be approximately 4 years beginning in 1998 and ending in 2001. If the less desirable well water was to be used, the rinse time would extend over an 8-year period from 1998 through 2005. An additional year for heap drain down would be required in either scenario.

South heap rinsing with reservoir water would require approximately 3 years beginning mid-year in 2003 and continuing through mid-2006. South heap rinsing with the production well water would require a 6-year period (i.e., mid-2003 through mid-2009). An additional year would be required for heap drain down under either scenario.

Disturbance associated with the existing heap leach pad and the proposed South Heap Leach Pad would total approximately 524 acres. Lifts on completed heaps would be contoured to a final average slope of 3H:1V or flatter to achieve stability while creating a variable contour interval. These recontoured slopes would be covered with a minimum of 1 foot of suitable plant growth media, then fertilized and seeded.

Operational experience normally leads to modifications in heap neutralization procedures to be used during reclamation. These modifications would be incorporated into an updated closure plan which would be submitted to the NDEP (pursuant to the NAC 445A.446-7) at least 2 years prior to the anticipated permanent closure of the process component.

Solution Ponds

Solution ponds would require reclamation at mine closure. Lined pond reclamation would consist of allowing contained sludge to dry to a manageable state. The liners would then be cut, folded over the dry sludge, and welded shut. The embankment would then be pushed over the encapsulated material, and the area would be contoured to promote runoff, reduce infiltration, and divert run-on. The contoured alluvial material would act as suitable plant growth material. Fertilization and seeding would be conducted after alluvial contouring. These reclamation activities would be completed in a manner to avoid potential effects to groundwater and revegetation. The sites would be revegetated with the seed mix listed in Table 2-4.

Surface Water Diversions and Impoundments

Unlined ponds (i.e., cooling pond, sediment ponds) would require reclamation at the end of mining. Material excavated during construction would be backfilled into the containment, and the area would be contoured to promote runoff, reduce infiltration, and divert run-on around the structure. The contoured alluvial material would act as suitable plant growth material. Fertilization and seeding would be conducted after alluvial contouring.

Surface water diversions would be constructed to divert run-on around reclaimed structures. These structures would remain in place after final reclamation.

Roads

Approximately 29 acres of haul and access roads would be reclaimed at the end of mining. Mining roads would be reclaimed by ripping compacted surfaces as needed, pulling up as much of the fill slope as practicable, and filling the cut slope to approximate the form of the land prior to disturbance as required by NAC 519A.345. Finally, suitable plant growth material would be spread and seeded. All culverts and cattle guards would be removed to restore drainage areas. Water bars would be installed on an as needed basis. Johnson Canyon Road and the public access road leading to the microwave tower would remain open.

Exploration Drilling Sites and Roads

Drilling sites and roads would be reclaimed, with the drilling sites being reclaimed prior to the roads. The dried mud pits would be filled with soil salvaged and stockpiled during construction and the remaining material would be graded to its approximate original contour. The remaining soil would be graded to its approximate original contour.

Surface reclamation of access roads would begin after the drill pad reclamation has been completed. The surface soil stripped during construction would be placed on the road surface and graded to the approximate original contour. Revegetation activities, including the broadcasting of seed, would be completed during the planting season (i.e., October through December) following reclamation.

Removal of Stored Fuels, Chemicals, and Blasting Supplies

Fuels and chemicals including blasting supplies would be consumed before the end of mining as feasibility dictates, and the remaining supplies would be removed from the site and returned to vendors.

Landfill Facilities

FCMI's Class III landfill is permitted to accept only industrial wastes generated by the facility. This Class III landfill would receive no wastes meeting the definition of a hazardous waste, or wastes that could produce pollutants or contaminants that may degrade waters of the state. Approval to operate this Class III landfill is contingent upon compliance with NAC 444.570 et. seq. and any applicable local ordinances or regulations.

This Class III landfill currently follows and would continue to follow the following maintenance schedule:

- A soil cover is applied weekly and compacted to a minimum of 6 inches to control litter, pests, and odors;
- Public access is restricted, and signs erected to identify the site and indicating acceptable and unacceptable wastes;
- Litter is controlled with periodic cleanup;
- Solid waste burning is prevented; and
- Erosion and run-off is controlled, and surface water is protected from pollutants.

Upon landfill closure, a layer of alluvial material would be pushed into the landfill from the surrounding embankment and compacted to a minimum depth of 24 inches. Alluvial material would be placed on any surface representing the final grade of the landfill. The surrounding embankment, composed of alluvial material, would be graded to allow for proper drainage of surface run-off and reduced infiltration. Lastly, this area will be fertilized and seeded.

Water Wells and Supplies Systems

All monitoring and production wells would be abandoned pursuant to NRS 534.

Exploration Drill Hole Abandonment

After data has been gathered from exploration drill holes, they would be abandoned pursuant to NRS 534, or other State Engineers Office guidelines.

Ancillary Facilities

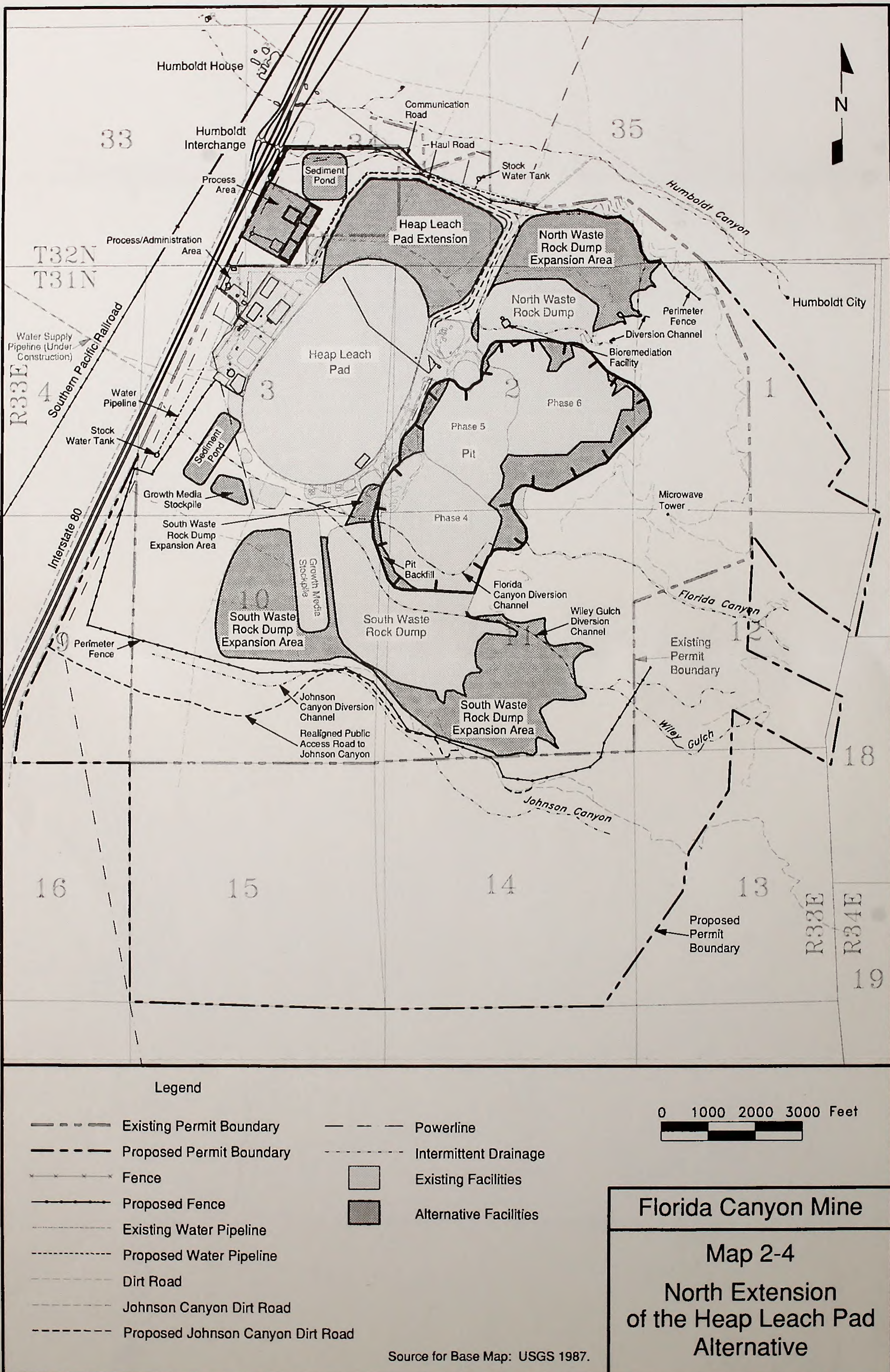
Ancillary facilities that would be reclaimed within the plan boundary at the end of mining include the plant, offices, shops, and related infrastructure. Underground utilities (power and water lines) would be disconnected and left in place to prevent excess surface disturbance. The exposed ends of the underground utilities would be capped or collapsed and covered by at least 3 to 4 feet of material. Surface utilities, except those controlled by Sierra Pacific Power Company, also would be removed.

2.3 North Extension of the Heap Leach Pad Alternative

The North Extension of the Heap Leach Pad Alternative would expand the existing heap leach pad to the north rather than construct a new heap leach pad to the south and would result in approximately 717 acres of total project surface disturbance (Map 2-4, Table 2-7). The leach pad extension would disturb approximately 156 acres. The existing North and South Waste Rock Dumps would be expanded by approximately 92 and 248 acres, respectively. A summary of total disturbance, including existing and North Extension of the Heap Leach Pad Alternative acreages, is presented in Table 2-8. A summary of reclamation acreages by project facility is presented in Table 2-9. Post-reclamation topography for the alternative is illustrated in Map 2-5. All other aspects of mine operation under this alternative would be the same as described for the Proposed Action Alternative.

2.4 No Action Alternative

Under the No Action Alternative, currently permitted operations (Amendment No. 8) at the Florida Canyon Mine would cease after 1997. Additional mineral resources in the project area would remain undeveloped, and no expansion or



Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 2-4

North Extension of the Heap Leach Pad Alternative

Table 2-7

North Extension of the Heap Leach Pad Alternative
Estimated Surface Disturbance Acreage by Facility and Land Status

Facility	Public Land	Private Land	Total
North Waste Rock Dump	12	80	92
South Waste Rock Dump	93	155	248
Existing Heap Leach Pad	130	26	156
Crushers and Shops	0	0	0
Plant and Offices	1	0	1
Roads	3	3	6
Ponds	15	19	34
Pits	70	18	88
Water System and Wells	0.6	0.1	0.7
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads	65	10	75
Total	390	327	717

Table 2-8

Total Acres of Disturbance After North Extension of the Heap Leach Pad Alternative

Facility	Public Land	Private Land	Total
North Waste Rock Dump	119	80	199
South Waste Rock Dump	225	279	504
Existing Heap Leach Pad	187	290	477
Crushers and Shops	58	20	78
Plant and Offices	1	30	31
Roads	46	29	75
Ponds	19	43	62
Pits	222	93	315
Water System and Wells	2	1	3
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads	149	73	222
Total Disturbance	1,028	954	1,982

Note: These acres calculated by summing acres from the BLM Table 1 - *Acres of Existing Disturbance* and *Acre of Proposed New Disturbance* under the North Alternative from APO #10.

Table 2-9

Reclaimed Acres After North Extension of the Heap Leach Pad Alternative

Facility	Public Land	Private Land	Total
North Waste Rock Dump	119	80	199
South Waste Rock Dump	225	279	504
Existing Heap Leach Pad	187	290	477
Crushers and Shops[1]	22	0	22
Plant and Offices	9	97	106
Roads[2]	20	8	28
Ponds[3]	8	21	29
Pits[4]	151	86	237
Water System and Wells	2	1	3
Growth Media Stockpiles	0	16	16
Exploration Drill Pads and Roads[5]	144	58	202
Total Disturbance	887	936	1,823

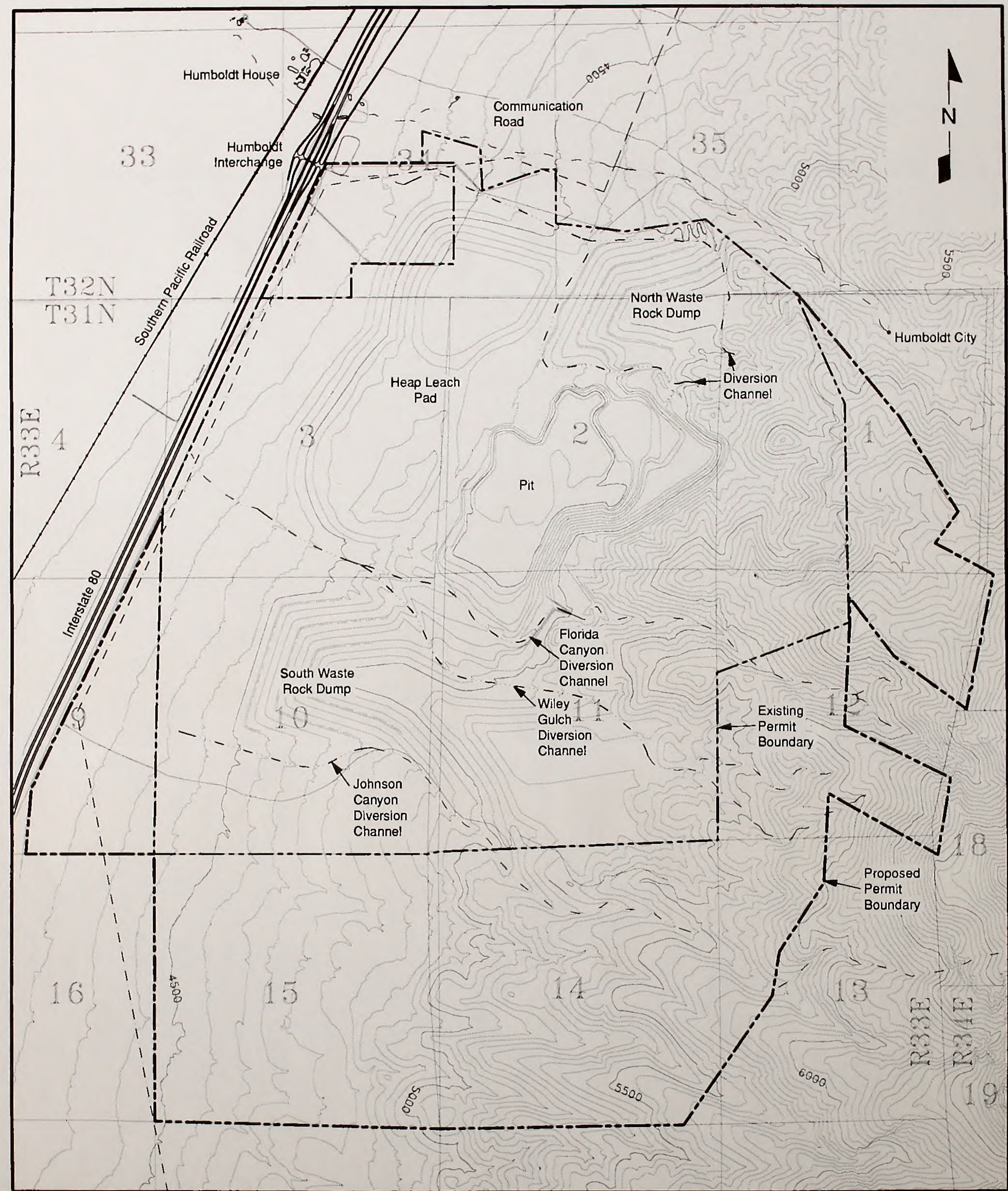
[1]Crusher A is taken out by pit expansion.

[2]Some road acreage is reclaimed with the leach pad(s), plant & offices, and pits. Johnson Canyon access road (5.2 acres) is not reclaimed.

[3]Some pond acreage is reclaimed with the plant & offices.

[4]Approximately 78 acres of the pit constitute highwall and therefore would not be reclaimed due to the lack of accessibility.

[5]Approximately 19.7 acres of exploration disturbance is taken out by pit expansion.



Legend

Existing Permit Boundary

Proposed Permit Boundary

Powerlines

Intermittent Drainage

0 1000 2000 3000 Feet

Contour Interval is 50 Feet

Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 2-5

Post-Mining Reclamation Topography North Extension of the Heap Leach Pad Alternative

construction of the mine pit, waste rock dumps, heap leach pads, or other ancillary facilities would occur. A summary of reclamation acreages by project facility for the No Action Alternative is presented in Table 2-10. Post-reclamation topography for this alternative is illustrated in Map 2-6.

Approximately 1,182 acres of the 1,259 acres of existing disturbance would be reclaimed from 1998 to 2003. Due to the steepness of the open pit highwall, reclamation would not be completed within highwall areas (approximately 60 acres). During 1996, two power transmission lines were relocated, which required 24 acres of disturbance for service roads. These roads would not be reclaimed since these roads would be used by Sierra Pacific Power Company. Earthwork activities, including contouring, spreading of suitable plant growth media, seeding, and fertilizing activities, would be completed in 1998 on the waste rock dumps (364 acres), pits (168 acres), and on exploration roads and pads (147 acres). Rinsing the pad would begin in 1998 and continue through 2001 if water from Lower Pitt-Taylor Reservoir is used. This scenario would allow earthwork activities to be completed for 80 acres of heap disturbance each year. Rinsing with water from the production wells would extend the rinse time from 1998 through 2005, thus allowing only 40 acres per year available for earthwork activities.

Demolition and removal of the crushers and shops would occur in 1999, resulting in 78 acres of disturbance being reclaimed in addition to 80 acres of leach pad disturbance each year. Rinsing and earthwork activities for the leach pad would continue (dependent on the rinse water source) through either 2001 or 2005 followed by a year of drain down in either 2002 or 2006. After drain down is completed, demolition and removal of the plant and offices; water system and wells; and pond reclamation would commence in either 2003 or 2007. This would result in the reclamation of 30 acres, 2 acres, and 27 acres for each facility category, respectively. During the final phase, all roads would be reclaimed (69 acres) in 2004 or 2008 (FCMI 1996).

2.5 Alternatives Considered but Eliminated from Detailed Analysis

2.5.1 Completely Backfilling the Pit

Approximately 255 million tons of material, including 33 million tons of rinsed and off-loaded leach pad material, would be required to completely backfill the proposed mine pit expansion area. Based on the mine plan and pit configuration, backfilling could not commence until late in the project life; therefore, most of the backfilled material would be hauled from the waste rock dump. The backfilling operation would occur over a 5-year period and would require approximately 150 hourly and salaried employees.

Backfilling the pit is not considered economically feasible because it would increase the total mining cost from approximately $.55 per waste ton to approximately $1.00 per waste ton and the FCMI Project would incur a total additional cost of approximately $89 million. More importantly, completely backfilling the mine pit would cover additional mineral resources making possible future development less attractive.

Because the combined factors make this alternative impractical, completely backfilling the pit has been eliminated from detailed analysis and the environmental impacts have not been evaluated in the EIS.

2.5.2 South Extension of the Leach Pad

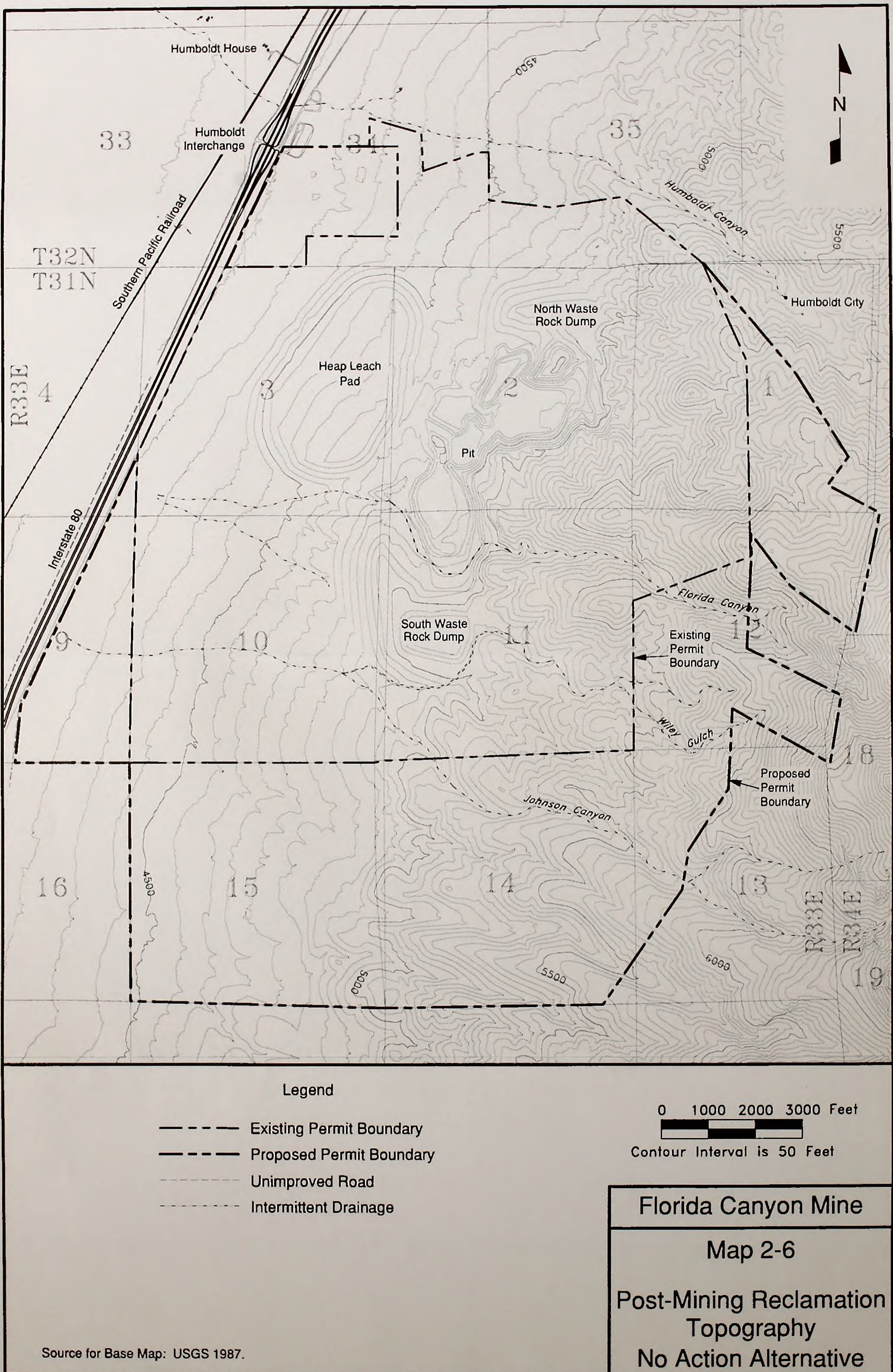
The South Extension Alternative for the existing leach pad was evaluated and deemed impractical since this would interfere with the planned restoration of the Florida Canyon drainage. As a result, this alternative has been eliminated from detailed analysis and the environmental impacts have not been evaluated in the EIS.

Table 2-10

Reclaimed Acres After No Action Alternative

Facility	Public Land	Private Land	Total
North Waste Rock Dump	107	0	107
South Waste Rock Dump	133	124	257
Existing Heap Leach Pad	57	264	321
Crushers and Shops	58	20	78
Plant and Offices	0	30	30
Roads	34	11	45
Ponds	4	23	27
Pits	115	53	168
Water System and Wells	1	1	2
Exploration Drill Pads and Roads	84	63	147
Total Disturbance	593	589	1,182

Note: These acres calculated by summing net acres disturbed from Table 1 - *Current Disturbance of Facilities and Reclamation Through 1995* and proposed disturbed acres from Table 2 - *Acres of Proposed New Disturbance* found in APO #8.



Florida Canyon Mine

Map 2-6

Post-Mining Reclamation Topography No Action Alternative

2.6 Summary Comparison of Impacts Among the Proposed Action and Alternatives

Table 2-11 summarizes and compares the environmental impacts among the Proposed Action and the two Alternatives considered in detail: the North Extension of the Heap Leach Pad Alternative and the No Action Alternative. Detailed descriptions of impacts are contained in Chapter 3.0. The summarized impacts include the implementation of mitigation measures presented as part of the resource discussions in Chapter 3.0.

Table 2-11

Comparison of the Proposed Action and Alternatives

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Geology and Minerals	700,000 ounces of gold and 700,000 ounces of silver would be permanently removed.	700,000 ounces of gold and 700,000 ounces of silver would be permanently removed.	No gold or silver would be produced.
Water Resources and Geochemistry	Groundwater modeling indicates that water drawdown effects would not extend beyond the proposed permit boundary to the north and west and would not impact wells located northwest of the project area. No seeps or springs would be impacted. Loss of 3.1 acres of other waters of the U.S.	Groundwater impacts would be the same as the Proposed Action. Loss of 3 acres of other waters of the U.S. Cyanide source would be located closer to the wells located northwest of the project area.	No impacts to water resources would occur as compared to the Proposed Action.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Air Quality	The proposed expansion of the mine would result in additional emissions over the short-term. Modeling results indicate that maximum concentrations of PM_{10}, NO_2, CO, and SO_2 would not exceed Nevada or National Ambient Air Quality Standards. FCMI plans to follow standard construction practices to minimize fugitive emissions and impacts to air quality. The project would comply with all existing air quality standards in Nevada.	Same as the Proposed Action.	No impacts to air quality.
Soils	Ten soil series and 860 acres would be disturbed. Soils would be salvaged during ground-disturbing activities.	Ten soil series and 717 acres would be disturbed. Soils would be salvaged during ground-disturbing activities.	No additional soils would be impacted. Reclamation could be completed sooner.
Vegetation Resources	Two major plant communities totalling 860 acres would be disturbed. Areas that are not reclaimed would have a long-term loss of forage production.	Two major plant communities totalling 717 acres would be disturbed. Areas that are not reclaimed would have a long-term loss of forage production.	No additional vegetation would be disturbed or removed. Reclamation and revegetation of existing disturbance would be completed sooner.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Wildlife and Fisheries Resources			
Wildlife habitat disturbed	860 acres would be disturbed.	717 acres would be disturbed.	No additional wildlife habitat would be disturbed.
Wildlife habitat not reclaimed	19 acres (pit expansion) would not be reclaimed.	Same as the Proposed Action.	No additional wildlife habitat would be disturbed.
Mule deer winter range disturbed	860 acres would be disturbed; 19 acres would not be reclaimed.	717 acres would be disturbed; 19 acres would not be reclaimed.	No additional wildlife habitat would be disturbed.
Animal displacement and habitat fragmentation	Increased displacement and habitat fragmentation from mine development.	Same as the Proposed Action.	No additional displacement or fragmentation.
Impacts to breeding birds	Habitat removal; possible loss of nests, eggs, or young.	Same as the Proposed Action.	No adverse effects to breeding birds.
Noise and human presence.	Slight increased noise and access from mine construction.	Same as the Proposed Action.	Increased noise and human access; would continue at the current level.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Special Status Species			
Loss of potential burrowing owl habitat.	860 acres of shadscale and sagebrush vegetation disturbed.	717 acres of shadscale and sagebrush vegetation would be disturbed.	No additional habitat would be disturbed.
Range Resources	Temporary loss of 44 animal unit months and permanent loss of 1 animal unit month.	Same as the Proposed Action.	No permanent loss of animal unit months would occur.
Land Use and Access	447 acres of public lands currently used for grazing and dispersed recreation would be converted to mining activities. The action would not result in the permanent disruption of existing rights-of-way or access to public lands in the mine vicinity.	390 acres of public lands currently used for grazing and dispersed recreation would be converted to mining activities. No permanent disruption to existing rights-of-way or public access would occur.	There would be no change from current uses in the project area.
Recreation	447 acres of public land would be temporarily removed from dispersed recreational use; however, adjacent public lands could be utilized. Developed recreational facilities in the region are not expected to be adversely impacted.	Same as the Proposed Action except 390 acres of public lands would be temporarily removed from dispersed recreational use.	Public lands within the project area would not be dedicated for mining and would remain available for dispersed recreational uses.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Aesthetics (Visual and Noise Resources)	Visual contrast allowable for Visual Resource Management Class II lands within the mine site would be exceeded as a result of the new leach pad and expanded waste rock dumps. Proposed reclamation would reduce the magnitude of most of these contrasts over time, ultimately resulting in Class II objectives being met within 10 years after the reclamation period.	Visual resource impacts would be the same as the Proposed Action.	Management guidelines for Visual Resource Management Class II lands would continue to be exceeded as a result of current mining operations and would be met only after the reclamation period. Project-related disturbance and construction would not occur.
	Noise from mine operations would be perceptible at nearby sensitive receptors but would be expected to remain below recognized standards.	Noise impacts would increase as compared to the Proposed Action, but would be expected to remain below recognized noise standards.	Existing noise levels would decrease as current mining activities are completed and reclamation of the site is completed.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Social and Economic Values	An average construction work force of 43 would be employed for 12 months, yielding employment and income benefits for the county and local communities. Increased sales taxes would result from additional economic activity. The new population would minimally impact local temporary housing markets and some public services. Operations work force employment would continue at approximately current levels, extending the employment and income benefits in the economy through 2002. Direct contributions to property tax, net proceeds tax, and sales taxes would continue, as would the indirect economic benefits of secondary employment, income, purchases of good and services, and resulting tax revenues. Mine closure in 2002 would result in a phasing out of employment,	Same as the Proposed Action.	Mine closure in 1997 would result in the termination of the current employment of 328 operations personnel, and the associated direct and indirect economic benefits in local communities. Tax revenues would be phased out. Potential future economic benefits of mine operation would be foregone.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
	income, tax revenues, and other economic benefits. The primary communities affected would be Pershing County, Winnemucca, Lovelock, and Humboldt County.		
Cultural Resources, Ethnography, and Paleontology	Three NRHP-eligible or potentially eligible sites would be directly impacted. No Tribal concerns or traditional use sites have been identified. Therefore, no impacts are anticipated.	Same as the Proposed Action.	No cultural sites would be directly impacted. Erosional effects and illegal collecting would continue to occur.
	No impacts to paleontological resources are expected.	Same as the Proposed Action.	No impacts to paleontological resources.

Table 2-11 (Continued)

Resource Areas	Proposed Action	North Extension of the Heap Leach Pad Alternative	No Action
Hazardous Materials	Spills could be associated with truck deliveries of process chemicals and fuels. The number of chemical or fuel releases expected during project life is about 0.05. Emergency response actions would contain and cleanup any spill. Chemicals and fuels kept in storage would be contained, minimizing spill impacts.	Same as the Proposed Action.	Spill potential would be substantially reduced at the end of currently permitted mine operations.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the environment that would be affected by the proposed FCMI Project and the direct and indirect impacts of the Proposed Action, the North Extension of the Heap Leach Pad Alternative, and the No Action Alternative. The baseline information summarized in this chapter was obtained from published and unpublished materials; interviews with local, state, and Federal agencies; and from field and laboratory studies in the project area. For resources such as soils and vegetation, the affected area was determined to be the physical location and immediate vicinity of the areas to be disturbed by the proposed project. For other resources such as water resources and geochemistry, air quality, wildlife, social and economic values, and the transport of hazardous materials, the affected environment was more extensive. For each of the 15 categories of resources, the affected environment was defined by the potential environmental impacts of the Proposed Action.

The analysis of impacts from the Proposed Action and Alternatives assumed the implementation of the Environmental Protection Measures that have been developed as part of the Proposed Action and are presented in Chapter 2.0. Potential mitigation and monitoring measures developed in response to anticipated impacts are discussed at the end of each resource section. All actions listed as potential mitigation measures have been developed by the BLM and are not part of the Proposed Action. These measures could be required by the BLM as a condition or stipulation of approval of the Plan of Operations. Residual adverse impacts are those remaining following the implementation of the potential mitigation measures. A discussion of cumulative impacts is included for each resource. Descriptions of short-term uses compared to long-term productivity, irreversible or irretrievable commitments of resources, and energy consumption by the proposed project are provided at the end of the chapter.

Wild horses occurred in the Humboldt Range at the time the Free-Roaming Wild Horses and Burro Act (Pub.L 92-195) was passed in 1971. Therefore the Humboldt/West Humboldt Range was designated a Wild Horse Herd Area. However, since the project area is in a checkerboard area, horses are managed for a population of zero. In the summer of 1993 a wild horse gather was conducted on the Humboldt/West Humboldt Herd Area. Since that time there have been no horses in the project area and therefore, need be of no concern to the mine expansion.

The BLM's NEPA Handbook (H-1790-1) requires that all EISs address certain Critical Elements of the Human Environment. These critical elements are presented below along with the location in this chapter where the element is discussed. If the element does not occur within the project area and would not be affected, this is indicated below, and the element is not discussed further in the EIS. This elimination of nonrelevant issues follows the CEQ guidelines as stated in 40 CFR 1500.4.

- Air Quality - refer to Section 3.4.
- Areas of Critical Environmental Concern - none would be affected.
- Cultural Heritage - refer to Section 3.14.
- Prime or Unique Farmlands - none would be affected.
- Floodplains - none would be affected.
- Native American Religious Concerns - refer to Section 3.14.
- Special Status Species - refer to Section 3.8.
- Hazardous or Solid Wastes - refer to Sections 2.1.13 and 3.15.
- Drinking Water/Groundwater Quality - refer to Section 3.3.
- Wetlands and Riparian Zones - none would be affected.
- Wilderness - none would be affected.

- Paleontological Resources - refer to Section 3.14.
- Environmental Justice - would not be affected.

3.1 Interrelated Projects

Interrelated projects are defined for this EIS as those activities that have impacts which, when combined with impacts of the proposed project could result in cumulative effects on the environment. Resource-specific cumulative assessment areas were developed for each resource, as appropriate, and are discussed under their respective disciplines. Interrelated projects include past, present, and reasonably foreseeable future actions. The locations of interrelated projects are illustrated on Map 3-1, and they are described in the following sections.

As defined in 40 CFR 1508.7 (regulations for implementing the NEPA), a cumulative impact is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. BLM Instruction Memo NV-90-435 specifies that impacts must first be identified for the FCMI Project before cumulative impacts with interrelated projects can occur.

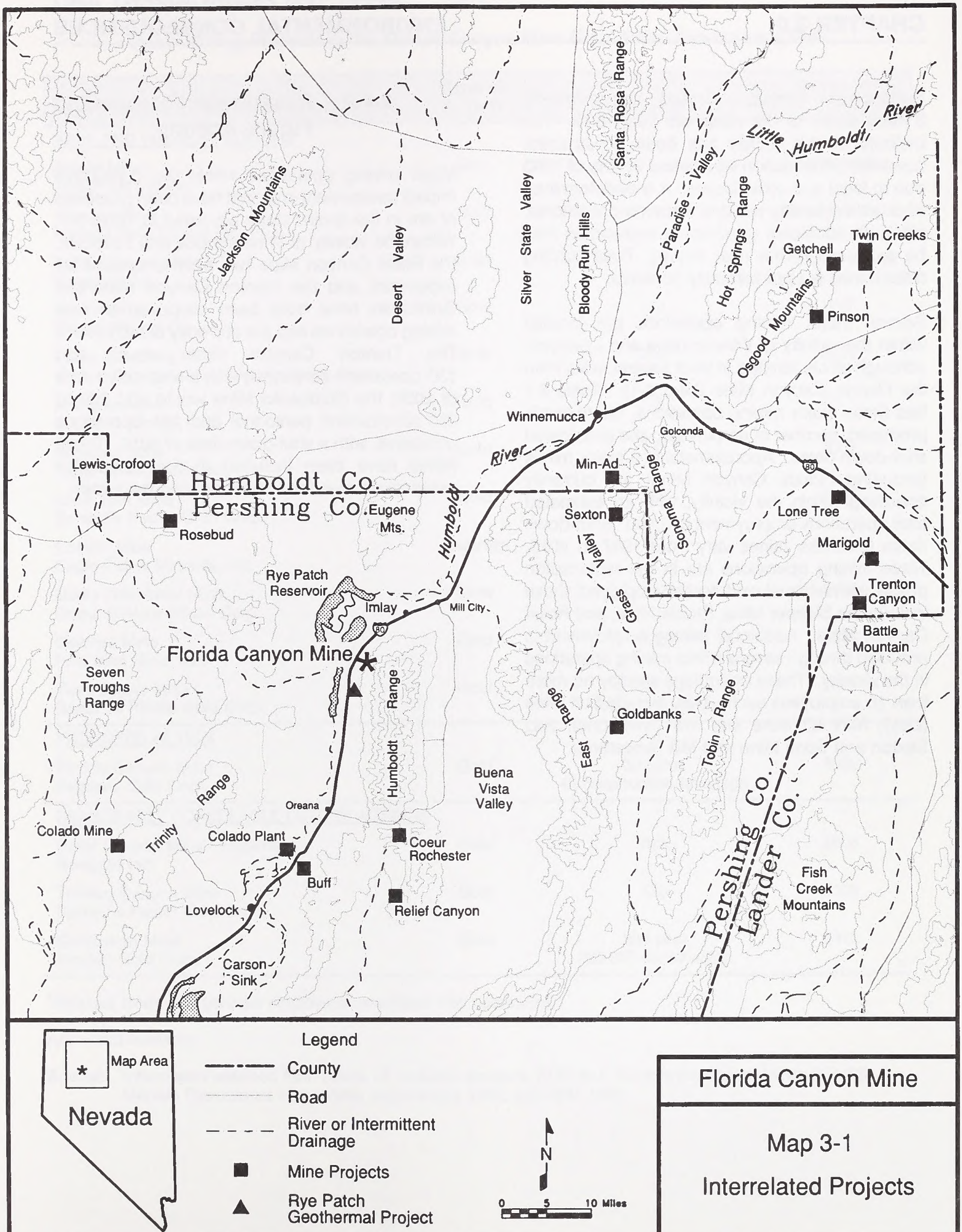
Interrelated projects with the potential for cumulative impacts were identified based on the type of activity, geographic location, and time period. A brief description of these actions is provided in this section. The area of concern for cumulative impacts varies by resource, with impacts to certain resources being restricted to the actual area of disturbance. The cumulative assessment area for most resources encompasses an area within a few miles or less of the proposed project site. The exception is the cumulative assessment area for socioeconomics, which includes all major mining projects within Humboldt and Pershing Counties.

3.1.1 Past and Present Actions

Historic activities in the area have primarily included mineral exploration and development, and livestock grazing. Mining activities have occurred throughout the area since gold was first discovered in Humboldt Canyon in 1860. Early prospecting resulted in the production of gold, silver, mercury, and tungsten from several small mines. The Standard gold mine was the largest and most productive operation during this time, yielding approximately $1 million in gold and silver from 1939 to 1942 and 1946 to 1949. Historic disturbances in this area totals approximately 100 acres. Additional minerals mined in the Imlay Mining District include fluorite, kaolin, and sulfur. Surface disturbance from historic mining operations in the area includes development of mine adits, shafts, open pits, waste rock piles, and other facilities. In addition, historic Humboldt City, located adjacent to Florida Canyon Mine's northeast boundary within Humboldt Canyon, contains many features including hundreds of building foundations and various mine prospects.

Reclamation was not required under BLM regulations prior to 1981. Since 1981, numerous small-scale mining activities have occurred on public land in the area. BLM records show that there have been a total of 139 mine plans and notices (excluding FCMI's) filed for an area measuring five townships by five townships around the Florida Canyon mine site (from Township 29N to 33N and Range 31E to 35E). No other major mining operations occur within the immediate vicinity of the Florida Canyon Mine. The current Florida Canyon Mine property was explored by three different mining companies, before being acquired and developed by Pegasus Gold Corporation. Exploration drilling for the project began in June of 1983. Mine construction activities began in early 1986, with mine operations beginning in August 1986. Total existing disturbance within the mine area includes 1,259 acres.

Other projects within close proximity to the Florida Canyon Mine include the Rye Patch



Florida Canyon Mine

Map 3-1

Interrelated Projects

Geothermal Project, located approximately 3 miles south of the mine site (Map 3-1). The majority of this facility has been constructed; however, construction was halted in May of 1993 due to legal and other issues. It is undetermined whether the facility will ever become operational, although additional geothermal exploration may be proposed in the near future. Total existing disturbance is approximately 50 acres.

Several major mining operations are located within the vicinity of Winnemucca and Lovelock, although all are located at least several miles from the Florida Canyon Mine (Map 3-1). Table 3-1 lists these major mining operations, the minerals produced, number of employees, and anticipated shut-down dates. Approximately 10 major mines (including Florida Canyon Mine) are currently operating within the vicinity, with an estimated total operations employment of 3,400. Shut-down dates for these mines vary from 1997 to 2015. Three mining operations are in the reclamation phase, with minimal work forces employed; these include the Sleeper Mine, Preble Mine, and Relief Canyon Mine. Additional mining employment is provided through several minor mining operations in the vicinity. These operations employ no more than 15 employees each. They include Buff Mine (clay), MIN-AD Mine and Mill (limestone), and Sexton and Sons Mine and Mill (limestone).

3.1.2 Reasonably Foreseeable Future Actions

Major mining operations within the cumulative impact assessment area that have been proposed or are in the review stage are listed in Table 3-1. Within the vicinity of Winnemucca and Lovelock, the Relief Canyon Mine has been proposed for expansion, and the Trenton Canyon Mine and Goldbanks Mine have been proposed as new mining operations and are currently under review. The Trenton Canyon Mine would add 130 operations personnel, with a shut-down date of 2005; the Goldbanks Mine would add 200 to 250 construction personnel and 284 operations personnel, with a shut-down date of 2010. These mines have been included in the cumulative assessment area for socioeconomic resources.

Table 3-1

Major Mining Projects in the Florida Canyon Mine Cumulative Assessment Area

Facility Name and Company	Type of Mineral	Employment[1]	Shut-Down Date
PAST AND PRESENT ACTIONS			
Preble Mine Pinson Mining Co.	Gold	---	In reclamation
Sleeper Mine Nevada Gold Mining Inc.	Gold	---	In reclamation
Relief Canyon Mine Newgold Inc.	Gold	3	In final mining stages
Pinson Mine Pinson Mining Co.	Gold	103	1997
Lewis & Crofoot Mine Hycroft Resources and Development, Inc.	Gold	250	2002
Marigold Mine Marigold Mining, Inc.	Gold	106	2004
Rosebud Mine Hecla Mining Company	Gold	100	2005
Lone Tree Mine Santa Fe Pacific Gold Corp.	Gold	353	2006
Colado Mine Eagle-Picher Minerals, Inc.	Diatomite	136	2010
Coeur Rochester Mine Coeur D'Alene Mines Corp.	Silver	292	2013
Getchell Mine First Miss Gold, Inc.	Gold	336	2015
Twin Creeks Mine Santa Fe Pacific Gold Corp.	Gold	1,400 plus 150 construction	2015
PROPOSED ACTION			
Florida Canyon Mine Pegasus Gold Corp.	Gold	301 plus 43 construction (average)	2002
REASONABLY FORSEEABLE FUTURE ACTIONS			
Relief Canyon Mine - Expansion Newgold Inc.	Gold	n/a	2003
Trenton Canyon Mine Santa Fe Pacific Gold Corp.	Gold	130	2005
Goldbanks Mine Kinross Gold Corp.	Gold	284 plus 200-250 construction	2010

[1]Includes direct and contract employees associated with operations.

n/a = not available.

Source: Information obtained from review of available literature, BLM files, Nevada Division of Minerals 1996, Nevada Department of Business and Industry 1996, and BLM 1996.

3.2 Geology and Minerals

3.2.1 Affected Environment

This section addresses the topography, regional geology, bedrock geology, surficial deposits, seismicity, geologic hazards, and mineral resources for the proposed project. The geologic elements discussed below also provide background information for the characterization of the hydrogeologic conditions presented in Section 3.3, Water Resources and Geochemistry.

3.2.1.1 Physiographic and Topographic Setting

The project is located in the Basin and Range Province of north-central Nevada on the northwestern flank of the Humboldt Range. The Basin and Range Province is characterized by a series of generally north-trending mountain ranges separated by broad basins developed through extension-related faulting that was initiated about 40 million years ago (Ekron et al. 1968). The ranges are uplifted fault blocks that consist chiefly of marine sedimentary rocks and younger volcanics. The basins are filled with accumulations of unconsolidated sediments that were mostly derived from the erosion of adjacent mountain ranges.

East of the project area the land surface rises sharply to the crest of the Humboldt Range where elevations are greater than 9,000 feet above sea level with the highest point being Star Peak (9,800 feet above sea level). West of the project area, a gently sloping alluvial apron extends toward Rye Patch Reservoir where elevations average approximately 4,150 feet above sea level.

3.2.1.2 Regional Geologic Setting

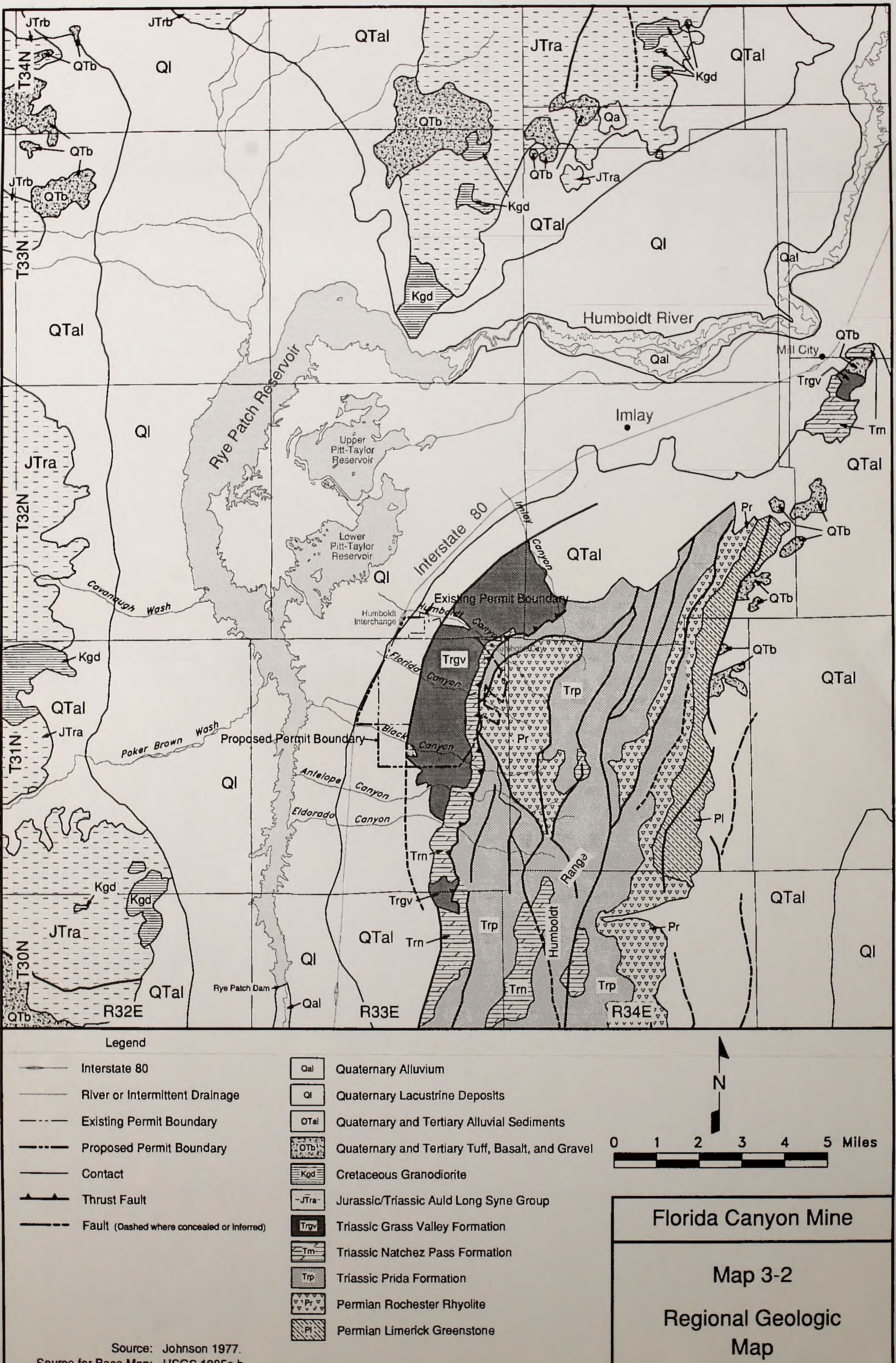
A simplified geologic map of the region based upon maps and information from Johnson (1977) is shown on Map 3-2. Rocks exposed in the region range in age from Triassic to Holocene and comprise thick sequences of sedimentary, volcanic, intrusive and metamorphic rocks in a complex structural environment. Triassic-age bedrock formations outcrop in the Humboldt Range, whereas unconsolidated Quaternary-age alluvium is deposited beneath the valley floor. A detailed stratigraphic column depicting the formations present near the mine is shown in Figure 3-1.

The Humboldt Range is bounded on the north and west by the Humboldt River Valley and on the east by the Buena Vista Valley. The oldest rocks exposed in the range comprise the early Triassic-age Koipato Group consisting of (from oldest to youngest) the Limerick Greenstone, Rochester Rhyolite, and Weaver Rhyolite members. These units consist of volcanic flows, tuffs, and tuffaceous sedimentary rocks that have been generally tilted to the south and regionally modified by major block faulting. These rocks are exposed in the tan-colored cliffs about 1 mile east of the project area and mid-way up in elevation in the Humboldt Range.

Unconformably overlying the Koipato is the Star Peak Group composed of the Middle Triassic-age Prida Formation that interfingers into the Lower-Upper Triassic-age Natchez Pass Formation. The Prida rocks grade upward from coarse clastics to carbonates to siltstones and sandstones, and the Natchez Pass Formation consists mainly of massive carbonates. These rocks are exposed in the gray-colored ridges east of the project area just below the cliffs of exposed rhyolite.

The Upper Triassic-age Grass Valley Formation conformably overlies the Natchez Pass Formation and is exposed in the northern and southern ends of the Humboldt Range in the Florida Canyon and Relief Canyon areas, respectively. The Grass Valley Formation is composed of metamorphosed siltstone forming slate, phylite, and argillite, which was further subjected to hydrothermal alteration and silicification. The formation is the host rock for the mineralization targeted by the current and proposed mining operations.

The youngest geological formations in the region are the Quaternary-age alluvial valley-fill deposits and lacustrine deposits located within the Humboldt River valley. The valley-fill deposits are comprised of unconsolidated clay, silt, sand, gravel, cobbles, and boulders eroded from the

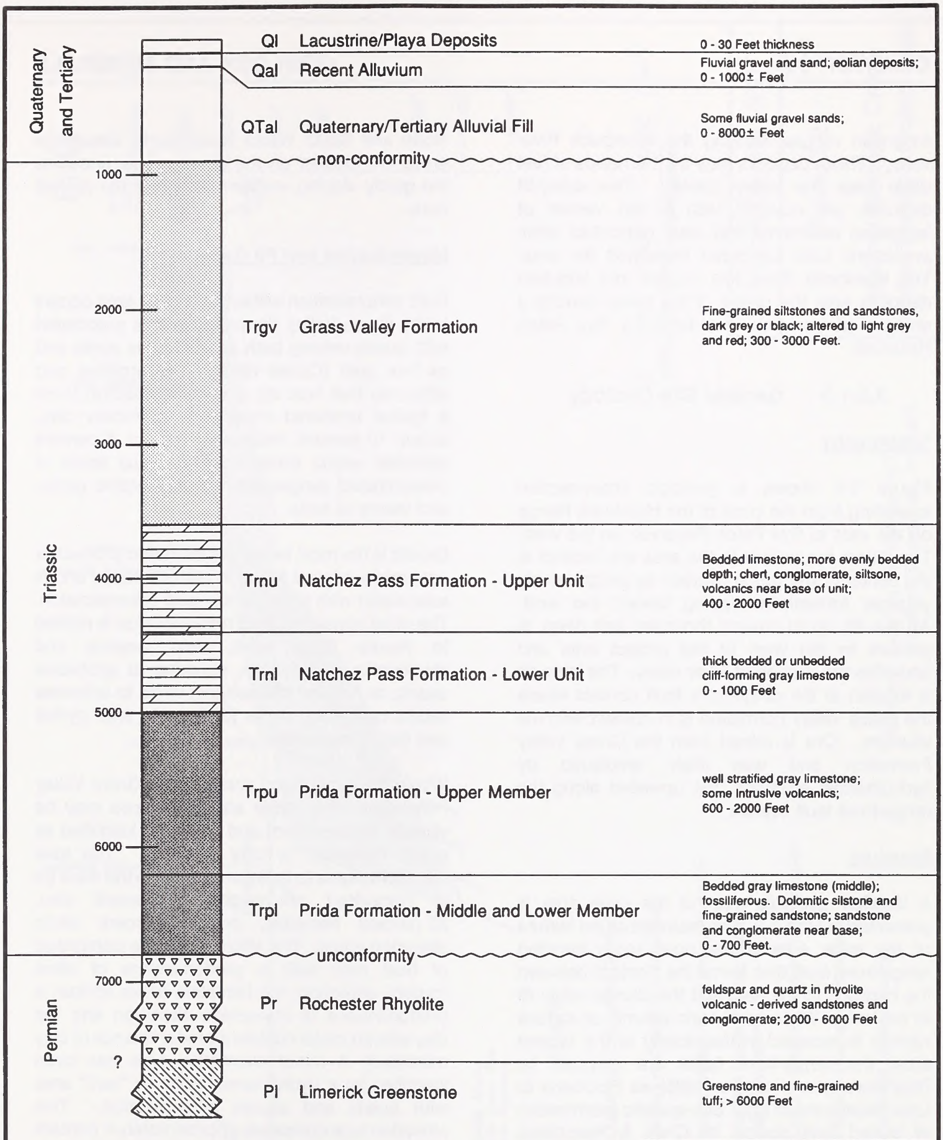


Source: Johnson 1977.
Source for Base Map: USGS 1985a,b.

Florida Canyon Mine

Map 3-2

Regional Geologic Map



Florida Canyon Mine

Figure 3-1

Stratigraphic Column

Source: Sibbett and Glenn 1981, Silberling and Wallace 1967, 1969.

mountain ranges flanking the Humboldt River valley. These deposits may be thousands of feet deep near the valley center. The valley-fill deposits are covered with a thin veneer of lacustrine sediments that were deposited when prehistoric Lake Lahontan inundated the area. The Humboldt River has incised into lake-bed deposits near the center of the valley forming a shallow canyon now inundated by Rye Patch Reservoir.

3.2.1.3 General Site Geology

Stratigraphy

Figure 3-2 shows a geologic cross-section extending from the crest of the Humboldt Range on the east to Rye Patch Reservoir on the west. The oldest formations in the area are located at the center of the range overlain by progressively younger formations dipping toward the west. Alluvial fill, up to several thousand feet deep, is present to the west of the project area and underlies the Humboldt River valley. The mine pit is located at the range-front fault contact where the Grass Valley Formation is in contact with the alluvium. Ore is mined from the Grass Valley Formation and was likely emplaced by hydrothermal solutions that upwelled along the range-front fault system.

Structure

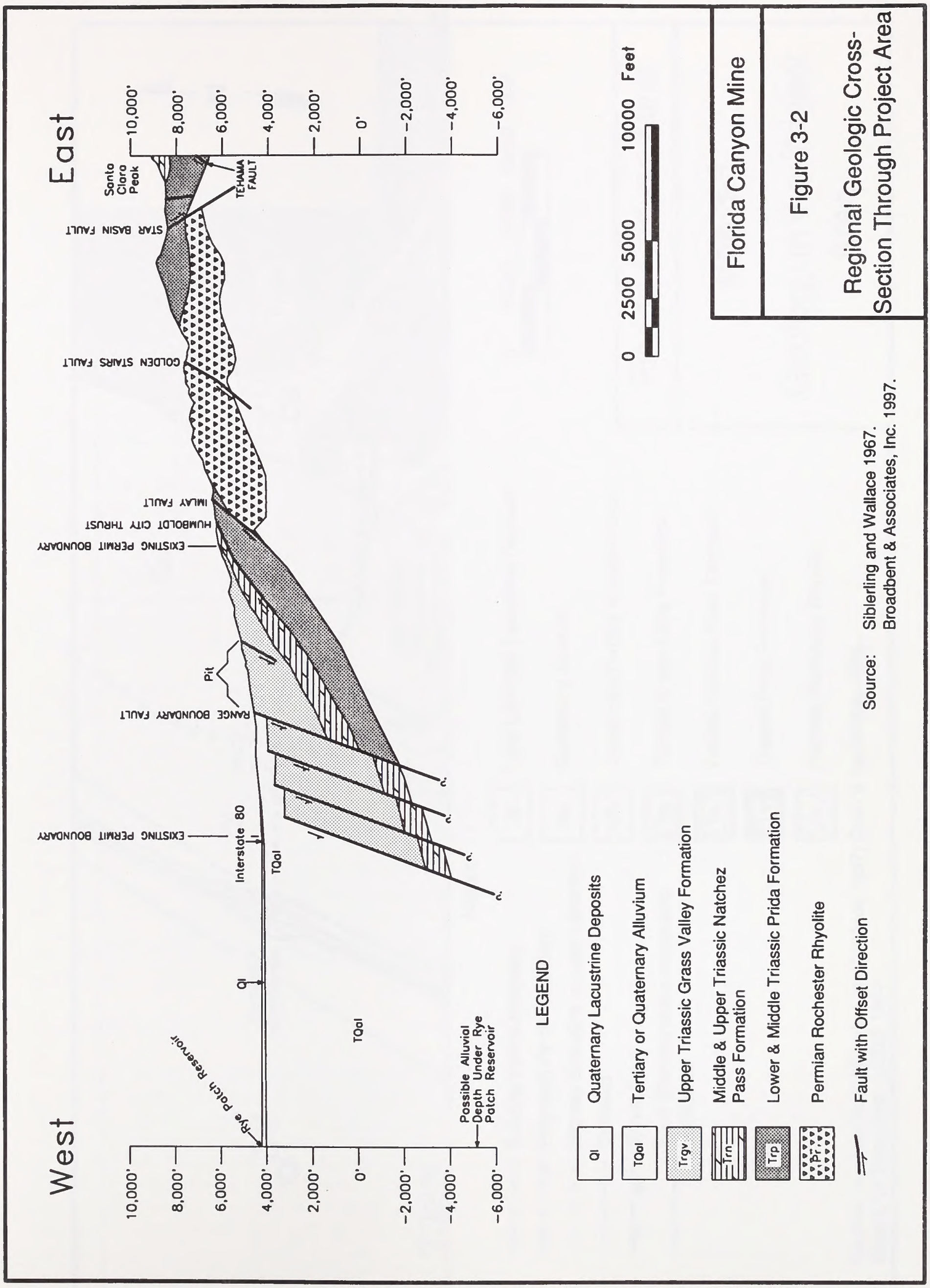
A detailed geologic map of the mine area is presented in Map 3-3. The main structural feature of the mine area is the north-south trending range-front fault that forms the contact between the bedrock to the east and the alluvial valley fill to the west. While no historic seismic or surface rupture is reported in the vicinity of the project area, the range-front faults are mapped by Dohrenwend and others (1995) as Holocene to Late Pleistocene in age. Site-specific examination of buried fault scarps by Chen & Associates (1985) revealed a vertical displacement across the fault of up to 8.5 feet. The mine pits and portions of the waste dumps are located on the Grass Valley Formation, which underlies the low hills to the east of the project area. The proposed South Heap Leach Pad and portions of the proposed North and South Waste Rock Dump Expansion areas are located on the alluvium that underlies the gently sloping western portion of the project area.

Mineralization and Pit Geology

Gold mineralization within the project area occurs in the Grass Valley Formation and is associated with quartz-veining both as auriferous pyrite and as free gold (Carver 1997). The argillites and siltstones that host the gold mineralization show a typical unaltered mineralogy of mostly clay, about 10 percent muscovite, up to 5 percent anhedral quartz (metamorphic), trace levels of disseminated syngenetic or metamorphic pyrite, and traces of rutile.

Quartz is the most important alteration product or secondary mineral found in the ore zones and is associated with some of the gold mineralization. The most consistent gold mineralization is related to fissure filling veins, vein swarms and stockworks of colorless, euhedral to subhedral quartz, or banded chalcedonic white to colorless quartz containing pyrite (or limonite after pyrite) and locally marcasite.

Within the mineralized zones of the Grass Valley Formation three major alteration types may be visually distinguished, and these are identified as silicic, hematitic, or clay by FCMI. The total material volume to be excavated from the mine pit is comprised of roughly 11 percent clay, 25 percent hematitic, and 38 percent silicic alteration types. The silicic rocks are comprised of host rock with a predominance of silica (quartz) alteration; the hematitic rocks contain a predominance of iron oxide alteration and the clay-altered rocks contain a predominance of clay minerals. A minor alternation type has been identified as a hydrothermal zone or "vent" area with quartz and alunite mineralization. This alteration type comprises approximately 4 percent of the total rock to be mined. A fifth minor alteration type consisting of sulfide rock makes up approximately 0.2 percent of the total rock to be mined. Alteration products include silicification, adularia, sericite, clay, and chlorite. Silicification is locally strong and pervasive and usually

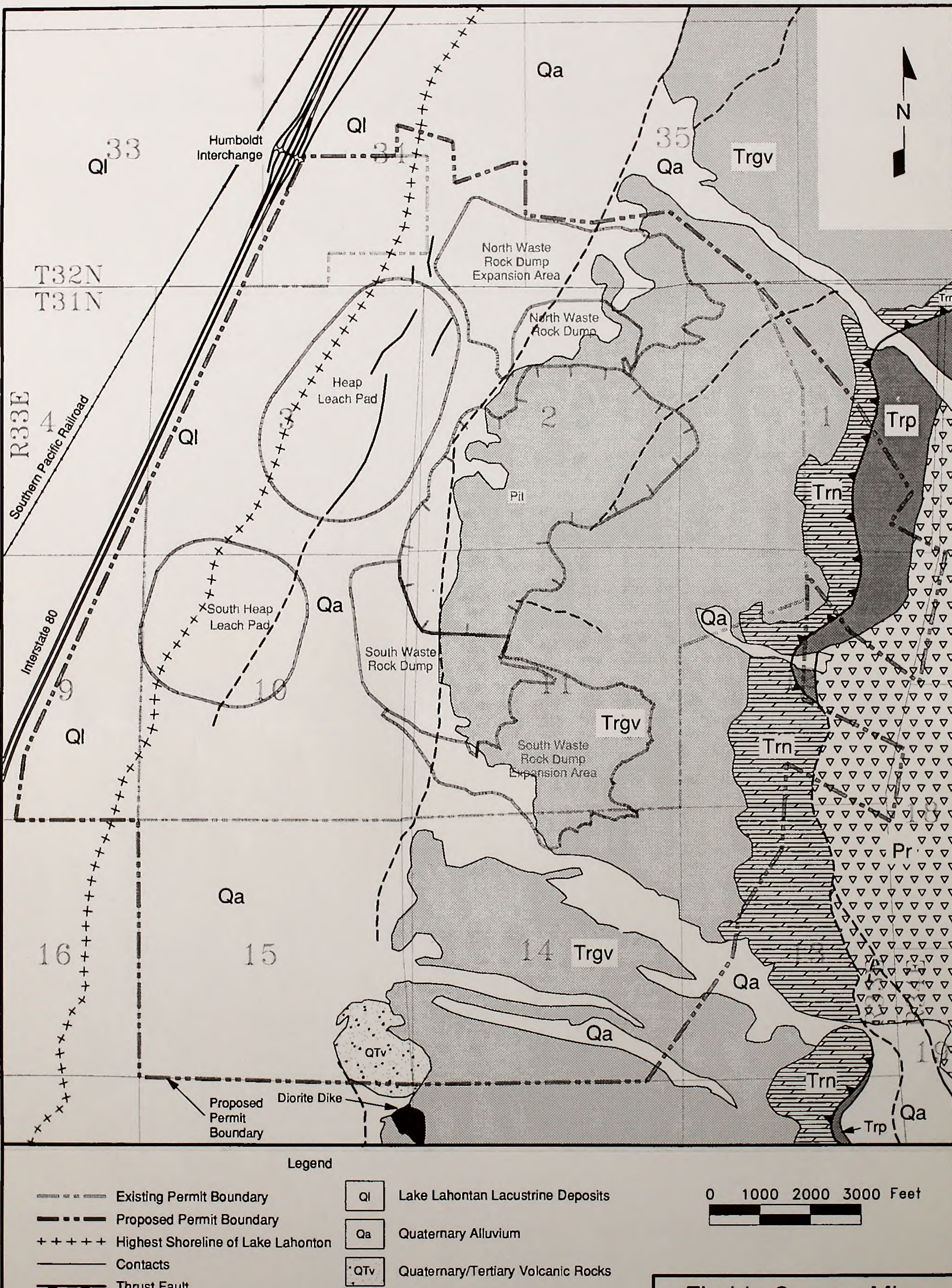


Source: Siblerling and Wallace 1967. Broadbent & Associates, Inc. 1997.

Florida Canyon Mine

Figure 3-2

Regional Geologic Cross-Section Through Project Area



Source: modified from Silberling and Wallace 1967; Chen & Associates 1985.
Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 3-3

Geology in the Project Area

associated with areas of intense quartz-veining or hydrothermal brecciation.

The mine pit is excavated into the Grass Valley Formation on the east side of the range-front fault. The west wall of the main pit is excavated into the alluvial valley fill which comprises about 22 percent of the total rock to be mined. The alluvium is not mineralized but must be excavated to gain access to the mineralized portions of the Grass Valley Formation.

Oil and Gas

Oil and gas production is low in Nevada; there are fewer than 50 producing wells in the state, according to the Nevada Division of Minerals (1995). The majority of the oil production comes from Railroad Valley in the southeastern portion of Nevada. Exploration in the state had dropped off until the oil embargo in the early 1970s. Within the past decade, some small productive wells have been established in four oil fields, in the northeastern corner of Eureka County near Elko (Nevada Division of Minerals 1993).

Currently, there is no oil and gas production in Pershing County. However, the BLM recently leased parcels in the Kyle Hot Springs area of Buena Vista Valley, located on the east side of the Humboldt Range, for oil and gas exploration. The lease sale was prompted by the presence of oil-laden water within a gold exploration hole drilled in 1993 about 1 mile south of Kyle Hot Springs. Potential geologic targets for oil and gas exploration have been identified within outcrops in the Humboldt Range in addition to other areas around Buena Vista Valley. The potential for oil and gas in the Humboldt River Valley is currently speculative in nature.

Geothermal Energy

The project is located on the northern edge of the Humboldt House geothermal area (Broadbent & Associates 1996b); however, no geothermal springs are located in the project vicinity. The partially constructed Rye Patch Geothermal Power Plant is located approximately 3 miles south of the project area. Geothermal waters were encountered at a depth of 1,700 to 1,850 feet during drilling activities at the Rye Patch Geothermal Power Plant, but sufficient flows to sustain an operating facility have yet to be delineated.

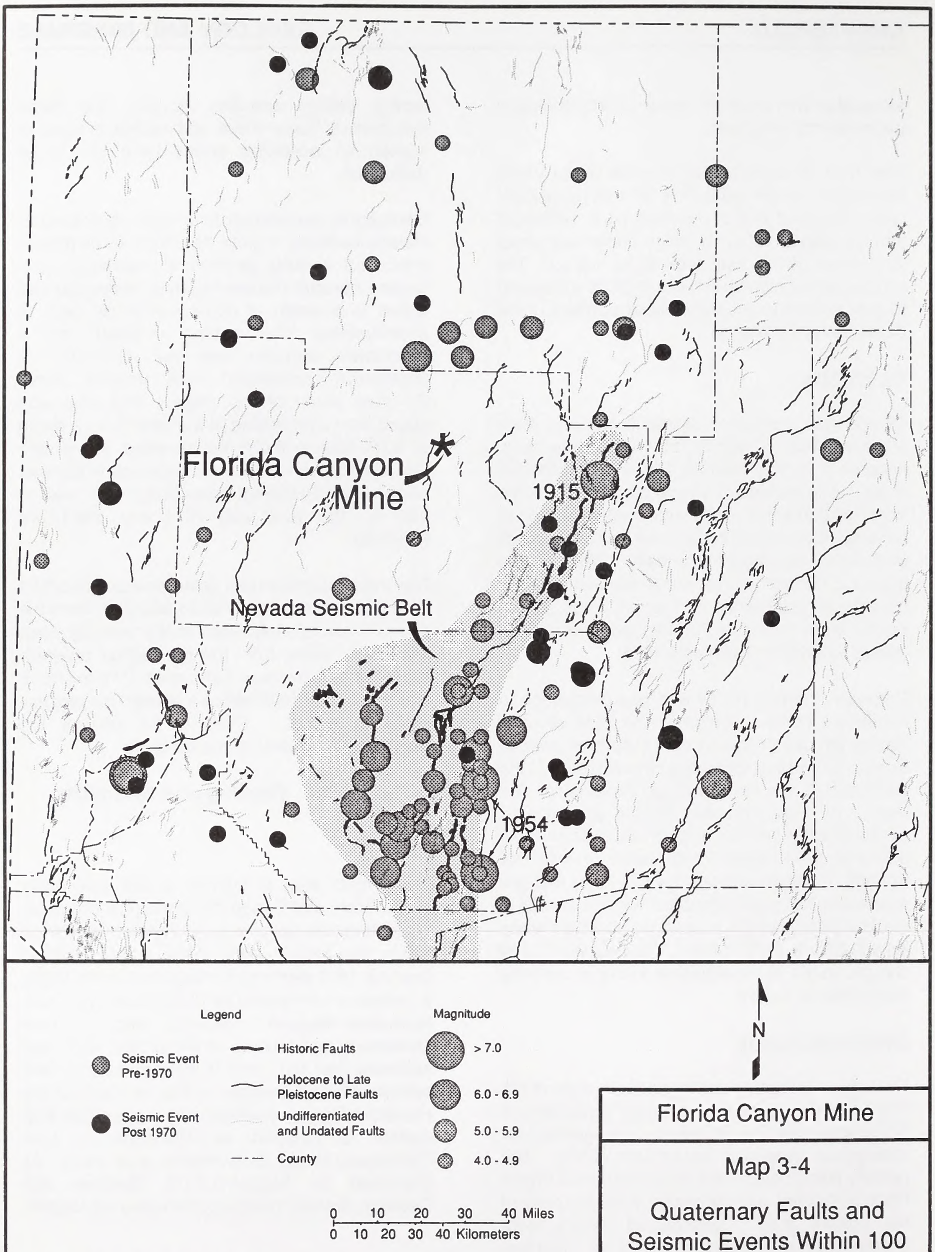
Geothermal exploration has been conducted at several locations in close proximity to the project area. An existing geothermal exploration well located beneath the existing heap leach pad was drilled to a depth of about 6,800 feet prior to abandonment after testing revealed that a productive resource was not present. A geothermal exploration well located about 2.3 miles south of the project area also was abandoned after testing of the zone from a depth of 5,280 feet to 8,036 feet revealed a dry well. Geophysical surveys were conducted in an area north of the Humboldt interchange and west of I-80 on the east side of Lower Pitt-Taylor Reservoir.

The mine currently uses groundwater withdrawn from a depth of about 700 to 800 feet, from the alluvium immediately west of the existing heap leach pad. Water from this geothermal reservoir averages 190 degrees Fahrenheit (°F) to 212°F and must be cooled before it is used for process make up water. There is no use of the geothermal resource at the mine site.

3.2.1.4 Faulting and Seismicity

Faulting

The project area is located in the seismically active Basin and Range Physiographic Province. While there has been no seismic activity recorded within the project area since record keeping began in 1872 (National Earthquake Center 1996), a number of Holocene to Pleistocene-age faults have been mapped in the area. Map 3-4 shows Quaternary-age faulting in the project area and indicates that the mine is located near a fault system, which is located on the west side of the Humboldt Range. Faulting in the range-front fault system is mapped as Holocene to Late Pleistocene in age (Dohrenwend et al. 1995). As discussed in Section 3.2.1.3, General Site Geology, detailed mapping of shallow exploration



Source for Fault Traces: Dohrenwend et al. 1995.
Source for Seismic Events: U.S.G.S. National Earthquake Information Center.

Florida Canyon Mine

Map 3-4

Quaternary Faults and Seismic Events Within 100 Miles of the Project Area

pits at the mine site by Chen & Associates (1985) revealed the presence of a buried fault scarp beneath the existing heap leach pad with an estimated vertical offset of approximately 8.5 feet.

Seismicity

The State of Nevada is seismically active due to the tectonic extension associated with Basin and Range activity. Earthquake records compiled by the National Earthquake Center (1996) in Golden, Colorado, from multiple databases indicate that of the earthquakes recorded within 100 miles of the project, 14 earthquakes had a magnitude of greater than 6.0 on the Richter scale (Table 3-2). A total of 645 earthquakes with a magnitude of greater than 3.0 have been recorded from 1872 to 1996 within a 100-mile radius of the site (Table 3-3). No recorded earthquakes have occurred within 10 miles of the project area. However, the presence of Quaternary-age faults in the project area indicates the possibility of future faulting activity.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action

Direct impacts of the Proposed Action on geologic and mineral resources would include the generation and permanent disposal of approximately 147 million tons of waste rock and overburden and approximately 60 million tons of spent ore and the extraction of approximately 700,000 ounces of gold and 700,000 ounces of silver from the ore resource.

Existing geologic information and condemnation drilling results indicate that no known mineral resources lie beneath the proposed waste rock dump expansion areas. Condemnation drilling is currently being conducted in the area of the proposed South Heap Leach Pad. Therefore, once condemnation drilling is complete, placement of these facilities would not inhibit future attempts to recover minerals from the area, except for decreasing access to the alluvium below. While oil and gas exploration is taking place in Buena Vista Valley east of the Humboldt Range, the potential for oil and gas in the project area is speculative in nature. Geothermal exploration has not revealed an economic resource in the project area.

While the range-front fault extending north-south through the project area is Holocene to Late Pleistocene in age, there have been no earthquakes within the project area since record keeping began in the area in 1872 (see Section 3.2.1.4, Faulting and Seismicity). Chen & Associates (1985) estimated that there is a greater than 99.9 percent probability that a surface rupture faulting event would not take place during the active life of the existing leach pad. This estimate is assumed to apply to the area of the proposed South Heap Leach Pad. If a surface rupture faulting event were to occur, the leach pad liner could be ruptured. Surface faulting occurring after final reclamation should not create impacts, since the heap would be rinsed and seepage would not be anticipated to contain elevated levels of constituents.
Long-term stability of major facilities would be accomplished during reclamation by grading slopes to 3H:1V or less, which would be stable under virtually any seismic loading. The heap leach pad and waste rock dumps would be graded during reclamation to 3H:1V slopes. The pit highwalls excavated into bedrock could not be graded and would remain in the configuration attained at the end of mining. Weathering of the highwall would result in rolling and falling rocks which would accumulate on the bench surfaces remaining after mining.

3.2.2.2 North Extension of the Heap Leach Pad Alternative

No additional impacts to geologic and mineral resources beyond those identified for the Proposed Action would occur under the North Extension of the Heap Leach Pad Alternative. The same volume of ore and waste rock would be generated and disposed of under this alternative, as is described for the Proposed Action.

Table 3-2

Largest Seismic Events Within 100 Miles of the Project Area

Year	Month/Day	Location (Latitude, West Longitude)	Distance from Project (mi)	Richter Magnitude
1915	10/3	40.500/117.500	37	7.8
1852	(Unknown)	39.500/119.500	100	7.3
1954	12/16	39.200/118.000	93	7.2
1954	12/16	39.500/118.000	72	7.1
1954	12/16	39.670/117.870	62	6.9
1954	12/16	39.800/118.100	51	6.9
1954	8/24	39.420/118.530	79	6.8
1954	8/24	39.580/118.450	67	6.8
1954	7/6	39.420/118.530	80	6.8
1954	7/6	39.200/118.400	93	6.4
1959	3/23	39.430/117.990	77	6.3
1959	3/23	39.600/118.020	65	6.3
1860	3/15	39.500/119.500	100	6.3
1872	11/12	39.500/117.000	96	6.0

Source: National Earthquake Center 1996.

Table 3-3

Seismic Events with a Magnitude Greater than 3.0
Recorded Near the Project Area Between 1872 and 1996

Local Magnitude	Number Within 100 Miles	Number Within 10 Miles
7.0 - 7.9	4 (4/0)	0
6.0 - 6.9	10 (10/0)	0
5.0 - 5.9	40 (34/6)	0
4.0 - 4.9	221 (182/39)	0
3.0 - 3.9	371 (215/156)	0

(X/Y): 'X' is number in database recorded prior to 1970; 'Y' are post-1970 occurrences.

Source: National Earthquake Center 1996.

3.2.2.3 No Action Alternative

No impacts to geologic and mineral resources would occur under the No Action Alternative beyond what is currently occurring under existing operations.

3.2.3 Cumulative Impacts

Surface mining activity affects geology and mineral resources by excavating, modifying, or covering natural topographic and geomorphic features and by removing mineral deposits. The cumulative assessment area for geology and mineral resources is shown on Map 3-5 and includes the Imlay Mining District and northern portion of the Rye Patch Mining District (Johnson 1977). Historically, the principal commodities mined in the districts included gold, silver, mercury, tungsten, and flourite. Approximately $2 million in commodities was extracted from 16 mines and/or prospects within the Imlay District between the late 1800s and the 1980s. The largest past surface disturbance in the district was likely the Standard Mine, an open-pit mine located about 5 miles south of the project area that produced $1 million in gold and silver. There are no reported mines or prospects within the northern portion of the Rye Patch District (Johnson 1977).

Mining disturbance has included open pit mining, waste rock disposal, heap leach ore processing, tailing disposal, and exploration (road construction and drilling pads). The estimated cumulative area of disturbance from past mining activities is approximately 100 acres. Present mining disturbance in the cumulative assessment area is estimated at approximately 1,316 acres; (including 1,259 acres for existing mine disturbance and 57 acres for operations at Freeport, American Copper and Nickel, and Minerals Association Mine). An additional 860 acres of disturbance is associated with the Proposed Action. No reasonably foreseeable future mining activities were identified within the cumulative assessment area for geology and mineral resources.

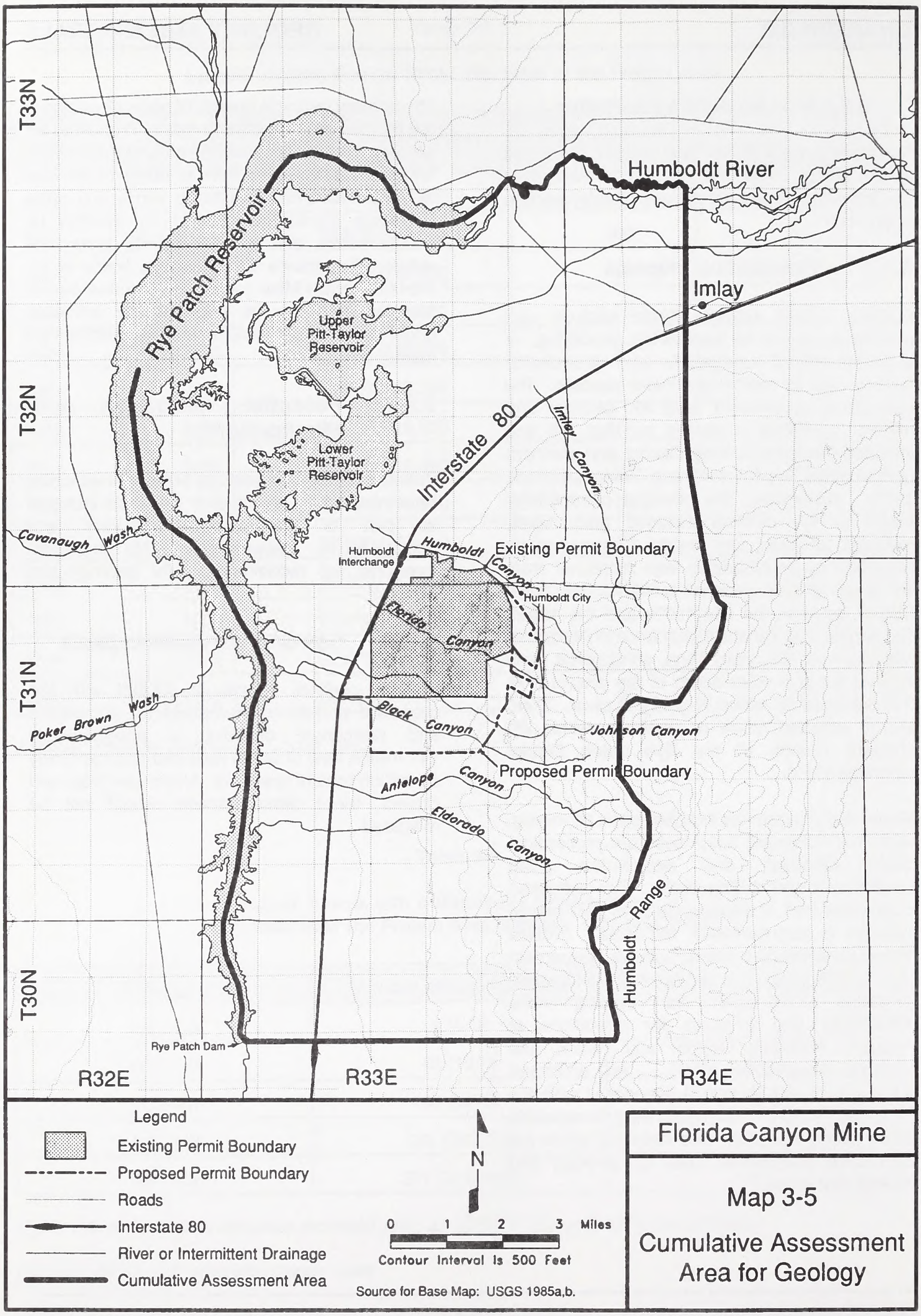
The primary geologic impact of open pit mining is the permanent removal and loss of resources for future generations. The removal of the resources is an inevitable result of mining; however, the loss of future resources by placing waste and other structures above them would be avoided by condemnation drilling. Operations under the existing disturbance and Proposed Action at the Florida Canyon Mine are expected to remove all reserves that can be economically extracted under currently available technology and current market conditions.

3.2.4 Potential Mitigation and Monitoring

Potential impacts to geology and minerals would be minimized by reclamation practices included as part of the proposed project (see Section 2.2.15, Reclamation). No additional measures are recommended for geology and minerals.

3.2.5 Residual Adverse Impacts

Adverse residual effects associated with the proposed project would include the generation and permanent disposal of approximately 147 million tons of waste rock and approximately 60 million tons of spent ore. Under the proposed project, these direct impacts would not be mitigated.



T33N
T32N
T31N
T30N
R32E
R33E
R34E
Humboldt River
Imlay
Rye Patch Reservoir
Upper Pitt-Taylor Reservoir
Lower Pitt-Taylor Reservoir
Interstate 80
Imlay Canyon
Cavanaugh Wash
Humboldt Interchange
Humboldt Canyon
Existing Permit Boundary
Humboldt City
Florida Canyon
Poker Brown Wash
Black Canyon
Johnson Canyon
Proposed Permit Boundary
Antelope Canyon
Eldorado Canyon
Humboldt Range
Rye Patch Dam
Legend
Existing Permit Boundary
Proposed Permit Boundary
Roads
Interstate 80
River or Intermittent Drainage
Cumulative Assessment Area
N
0 1 2 3 Miles
Contour Interval Is 500 Feet
Source for Base Map: USGS 1985a,b.
Florida Canyon Mine
Map 3-5
Cumulative Assessment Area for Geology

3.3 Water Resources and Geochemistry

3.3.1 Affected Environment

3.3.1.1 Geochemistry

Mineralization within the project area is hosted entirely within the Triassic-age Grass Valley Formation, which outcrops on the northwestern flank of the Humboldt Range (Section 3.2, Geology and Minerals). The Grass Valley Formation is fine-grained siltstone metamorphosed to slate or phyllite with interfingerings of fine sandstone. Three major alteration types (silicic, hematitic, and clay) can be identified visually within the mineralized zone currently being mined. The volume of ore and waste extracted from the mine is comprised of approximately 11 percent clay (CLAY), 25 percent hematitic (HEM), and 38 percent silicic (SIL) alteration types. A hydrothermal zone known as the "vent" area is comprised of portions of the clay and silicic alteration types containing quartz and alunite mineralization. The vent area is a fourth, minor alteration type (VENT) that comprises about 4 percent of the total ore and waste rock volume to be mined. Approximately 0.2 percent of the rock to be mined is unoxidized sulfide rock which comprises a fifth, minor alteration type known as SULF. Non-mineralized alluvium (ALUV) comprises the remaining 22 percent of the rock volume to be mined over the life of the mine.

The geochemistry of ore and waste rock is important to assessing the potential for the rock to produce acidic drainage containing heavy metals and other constituents at elevated levels. In the past, FCMI conducted sampling of waste rock from the project area, as required by the NDEP. Static testing of the samples (acid-base accounting) was conducted to determine the acid generating potential of the rock. If sample results exceeded testing criteria, then kinetic testing (humidity cell testing) was conducted to further evaluate the sample's acid generating potential. Nevada Meteoric Water Mobility tests were conducted to estimate the potential for dissolution of constituents from the rock into infiltrating precipitation. This sampling and testing of waste rock will continue throughout the life of the mine as required by the NDEP.

A geochemical site characterization was performed by SMI (1997) for FCMI and is summarized here. This geochemical site characterization was conducted to include an evaluation of future waste rock from the mine in addition to that already mined and characterized by data collected by FCMI. A complete copy of SMI's technical report is available for review at the Bureau of Land Management's Winnemucca district office and the Nevada State Office.

<u>Testing Methods</u>

The acid producing potential of a rock material may be estimated through the application of two basic types of test procedures, as follows:

1) Static testing is used primarily as a screening test to determine the potential of a given rock sample to generate acid. Acid-Base Accounting (ABA) and whole rock analysis are two types of static tests typically conducted to predict future potential for acid generation.

   In ABA testing, the acid generating potential (AGP, expressed as tons calcium carbonate per kiloton of sampled material [T/kT]) is estimated as the portion of the sample that is comprised of reactive sulfur (typically pyrite). The acid neutralizing potential (ANP) is estimated as that portion of the sample that is comprised of neutralizing minerals (typically carbonates; especially calcite). According to the BLM's Acid Rock Drainage Policy (BLM 1996), if the ratio of ANP to AGP is greater than 3 and the Net Neutralizing Potential (NNP; defined as ANP-AGP) is greater than 20 T/kT, then the rock is non-acid generating. If the results are less than the criteria, then there is uncertainty as to whether the rock would produce acid and further testing is recommended.

In whole rock analysis a rock sample is analyzed for the presence of a variety of elements typically found in rock samples. The results for each element are compared to average concentrations found in similar rock types to determine whether anomalous levels of any elements are present within the rocks of interest.

Static test results present a screening estimate of the acid generating potential of a rock sample. The test results do not provide information on the potential for metals dissolution. Under actual field weathering conditions it may be that the reactive sulfur and/or carbonate may not all be available for reaction and may not react at the same rate.

2) Kinetic testing is the simulation of rock weathering under controlled laboratory conditions. The most common kinetic test is the humidity cell test (SMI 1997) which simulates severe weathering in a humid environment. A sample of crushed waste rock is placed in a short column and moist air is allowed to flow vertically over the sample. Once a week the sample is flushed with deionized water to rinse the products of weathering from the surface of the sample. The rinse leachate is then analyzed for pH, conductivity, sulfate, acidity, alkalinity, and other constituents of interest. The test is typically run for at least 20 weeks.

Data Collection

Since 1991 FCMI has collected samples of waste rock on a quarterly basis for subsequent analysis by the static ABA method (SMI 1997). This has resulted in the collection of a total of 172 samples to date representing waste rock that has been mined from the deposit and placed on the existing waste rock dumps. In addition to the static testing, FCMI has conducted humidity cell tests on 14 split samples for at least 20 weeks (with the exception of one sample which was terminated after 15 weeks).

In order to expand the data set to represent rock to be mined in the future, SMI (1997) conducted additional sampling of the existing pit walls (as of February 1997) and selected samples from drill cuttings to characterize the rock materials yet to be mined. Nineteen pit wall samples were collected for whole rock analysis and static ABA analysis. Additional samples were selected from drill cuttings for ABA analysis for a total of 208 samples representing waste rock at the mine.

Table 3-4 presents a summary of data collected and analyzed for the geochemical site characterization. Histograms of the static test results show similar frequency distributions for samples of the existing and proposed waste rock at the mine indicating that the samples are derived from the same population (SMI 1997). This is consistent with the fact that the mineralized zone is located entirely within the Grass Valley Formation. Hence, in the discussions that follow the data for waste rock already mined is grouped and analyzed along with data for waste rock yet to be mined.

Static Test Results

Results of the whole rock analyses performed on 19 samples of pit wall rock as of February 1997 are presented in Appendix A1. The whole rock analysis results were compared to average elemental concentrations for shale (SMI 1997), a crustal rock type similar to the siltstone found at the Florida Canyon Mine. The comparison revealed that arsenic is somewhat elevated in most rock types, cadmium is elevated in alluvium, and antimony is somewhat elevated in silicic altered rocks.

Over the period of time that waste rock samples have been collected and analyzed by FCMI three different laboratories were used resulting in the use of different analytical methods for determination of static ABA. One laboratory used a method incompatible with the other two laboratories leading to the complete elimination of this laboratory's data for the purposes of this analysis. Another laboratory used a non-standard method for determining the pyritic sulfur portion

Table 3-4
Summary of Geochemical Testing

Test Type	Number of Samples	Remarks
Whole Rock Analysis	19	NDEP Profile II, metals analysis
Acid-Base Accounting	208	150 samples of existing waste rock, 63 samples of rock yet to be mined
	52	Repeat analysis of a portion of the 213 samples listed above
Meteoric Water Mobility Procedure	122	Conducted on samples also submitted for ABA
Humidity Cells	14	All but one sample run for more than 20 weeks

of each sample leading to an underestimate of this critical result. As a result of these inconsistencies in the laboratory methods and in order to maximize use of the existing data SMI (1997) utilized an overly conservative interpretation of the original data available from FCMI to estimate AGP.

Static ABA results for 208 samples are presented in Appendix A2 and summarized in Table 3-5. Overall, the rocks to be mined throughout the life of the mine have a greater ANP than AGP. However, the NNP is less than 20 T/kT and the ratio of ANP to AGP is less than 3 indicating that the data are not conclusive as to the potential for acid generation from the rocks at the mine and further testing is recommended.

In addition to the kinetic testing discussed below, FCMI also reanalyzed a portion of the 214 samples originally submitted for static ABA testing to obtain a consistent data set that did not require the overly conservative interpretation used above. These additional 52 samples were selected to include samples with the highest AGP from each of the six alteration and rock types found at the mine. Results of the reanalysis are presented in Appendix A3. The average pyritic sulfur concentration for each rock type except SULF is 0.12 percent or less with only one pyritic sulfur concentration above 0.2 percent. In contrast, the SULF rock samples have pyritic sulfur concentrations ranging from 0.03 to 0.89 percent consistent with the unoxidized character of these rocks. ABA results for the reanalyzed samples are presented in Table 3-5 and show that the rocks at Florida Canyon Mine (except SULF) do not exhibit a potential for acid generation, especially in light of the fact that these samples were selected from those that exhibited some of the highest AGP in the original data set.

Kinetic Test Results

Humidity cell tests were conducted on 14 samples from the Florida Canyon Mine. Complete results are presented by SMI (1997) and summarized in Table 3-6. With one exception (sample WR-82) all the samples submitted for humidity cell tests had an NNP less than 0.0 T/kT and an ANP/AGP ratio less than one. Most of the samples are from the vent area where the rocks with the lowest NNP and ANP/AGP ratio are found at the mine. The final pH for the humidity cell tests ranged from 5.75 to 7.47 suggesting that the rocks represented by these samples are unlikely to generate acidic seepage. Sulfate concentrations in the test leachates were highest in the first several weeks of the test suggesting the dissolution of soluble sulfate salts (SMI 1997). Subsequent sulfate production decreased and became linear after about 10 weeks of testing indicating a relatively constant rate of weathering of sulfur-containing minerals.

Table 3-6 shows, using the static ABA results for the humidity cell test samples, that the ANP present within each sample is consumed faster than the AGP. In fact, the ANP is completely consumed in two samples (WR-76 and WR-75) yet the humidity cells did not produce acidic leachate. Instead, dissolution of sulfur-containing minerals takes place slowly without generating acid. These results support the static ABA results which indicate that acidic seepage would not develop under field conditions.

Additional Rock Testing

A petrographic study of VENT rock samples (SMI 1997) was undertaken by the University of Illinois to determine the mineralogy of the VENT rocks. Understanding the mineralogy of a rock sample provides additional insight into the potential for acid generation. For instance, pyrite is typically the most common reactive sulfur mineral as represented by the ABA results. However, other sulfur minerals may be present within the reactive sulfur portion of the ABA result which react slowly and have only a mild acid generation potential, if any (SMI 1997).

The results indicate that less than 0.1 percent pyrite is present in the VENT rock samples and that all samples are cut by veinlets of quartz and alunite-quartz. Alunite is a mineral containing sulfur in its oxidized form along with aluminum and potassium. Dissolution of alunite is expected to take place slowly, if at all (SMI 1997), leading to the conclusion that the VENT rocks have a low potential to generate acid. This is consistent with the humidity cell test results which indicate that

Table 3-5

Summary of ABA Results for Original FCMI Data Set

Rock Type	Tonnage	ANP[1]	AGP[2]	NNP[3]	ANP/AGP[4]
ALUV	49,900,000	27.0	0.87	26.1	31.0
CLAY	24,000,000	6.43	2.34	4.1	2.7
HEM	56,600,000	5.47	2.31	3.2	2.4
SIL	83,300,000	8.42	8.80	-0.4	1.0
VENT	8,900,000	9.40	18.7	-9.3	0.5
SULF	400,000	2.25	10.5	-8.3	0.2
Total	**222,700,000**				

[1]Tonnage-weighted average ANP = 11.6

[2]Tonnage-weighted average AGP = 5.1

[3]Tonnage-weighted NNP = 6.6

[4]Tonnage-weighted ANP/AGP = 2.3

Summary of ABA Results for Reanalyses by Modified Sobek Method

Rock Type	ANP	AGP	NNP	ANP/AGP
ALUV	15.5	0.3	15.2	50
CLAY	6.4	1.0	5.4	6.4
HEM	10.0	1.6	8.4	6.2
SIL	8.9	3.6	5.3	2.5
VENT	11.3	1.0	10.2	11.0
SULF	1.0	14.1	-13.1	0.1

Table 3-26

Trends in Assessed Valuation and Taxable Sales - Humboldt and Pershing Counties

	1990	1991	1992	1993	1994	1995	Average Annual Increase
Humboldt County							
Taxable Sales	$215,026,000	$262,121,000	$256,092,000	$282,901,000	$288,019,000	---	8.5%
Assessed Valuation	$421,640,000	$453,726,000	$454,686,000	$474,371,000	$505,350,000	$544,309,000	5.8%
Assessed Valuation of Mining Properties	$86,376,000	$104,795,000	$136,335,000	$148,953,000	$161,335,000	---	21.7%
Pershing County							
Taxable Sales	$37,916,000	$42,685,000	$43,683,000	$51,932,000	$39,644,000	---	1.1%
Assessed Valuation	$147,664,000	$132,772,000	$131,110,000	$122,407,000	$152,190,000	$150,157,000	0.3%
Assessed Valuation of Mining Properties	$29,344,000	$29,580,000	$28,496,000	$28,302,000	$31,914,000	---	2.2%

Source: Tri-County Development Authority 1995, 1996a.

seepage from the VENT rocks is likely to have a near neutral pH.

Three of the 52 samples submitted for reanalysis (see above section on Static Test Results) were a triplicate sample from the VENT area containing alunite. The static ABA results for these samples indicate that there is virtually no pyritic sulfur present, approximately two-thirds of the total sulfur is present in a non-reactive form, and the remainder is present in the oxidized form as sulfate. Thin sections of the same samples indicate that alunite may be present in concentrations of about 2 percent. These results indicate that the sulfur contained within the alunite of the VENT rocks, which results in some of the highest concentrations of total sulfur in rocks from the mine, is non-reactive, and the rocks are not likely to generate acid.

As required by the NDEP, FCMI submits rock samples for analysis by the Nevada Meteoric Water Mobility test. This test provides an estimate of the concentration of constituents that may be released from the sample during an initial flushing by percolating rain waters or groundwater. Results for 122 samples are presented in SMI (1997). Most constituents are present at concentrations below the drinking water standard. Aluminum exceeded the drinking water standard in over half the samples while arsenic and iron exceeded the standards in about one-third of the samples. Lead exceeded the drinking water standard in about one-fifth of the samples while mercury, thallium, and total dissolved solids exceeded the standards in about one-tenth of the samples.

3.3.1.2 Surface Water

Hydrologic Setting

The project area is located in the Humboldt River Basin Hydrographic Region and in the Imlay Hydrographic Area (Rush et. al. 1974) (Map 3-6). Mean annual precipitation in the Imlay area is 6 to 8 inches, occurring mostly as snow during the winter. In contrast, evaporation in the area commonly averages 50 to 60 inches (Eakin 1962). These climatic conditions minimize the occurrence of surface waters in the region.

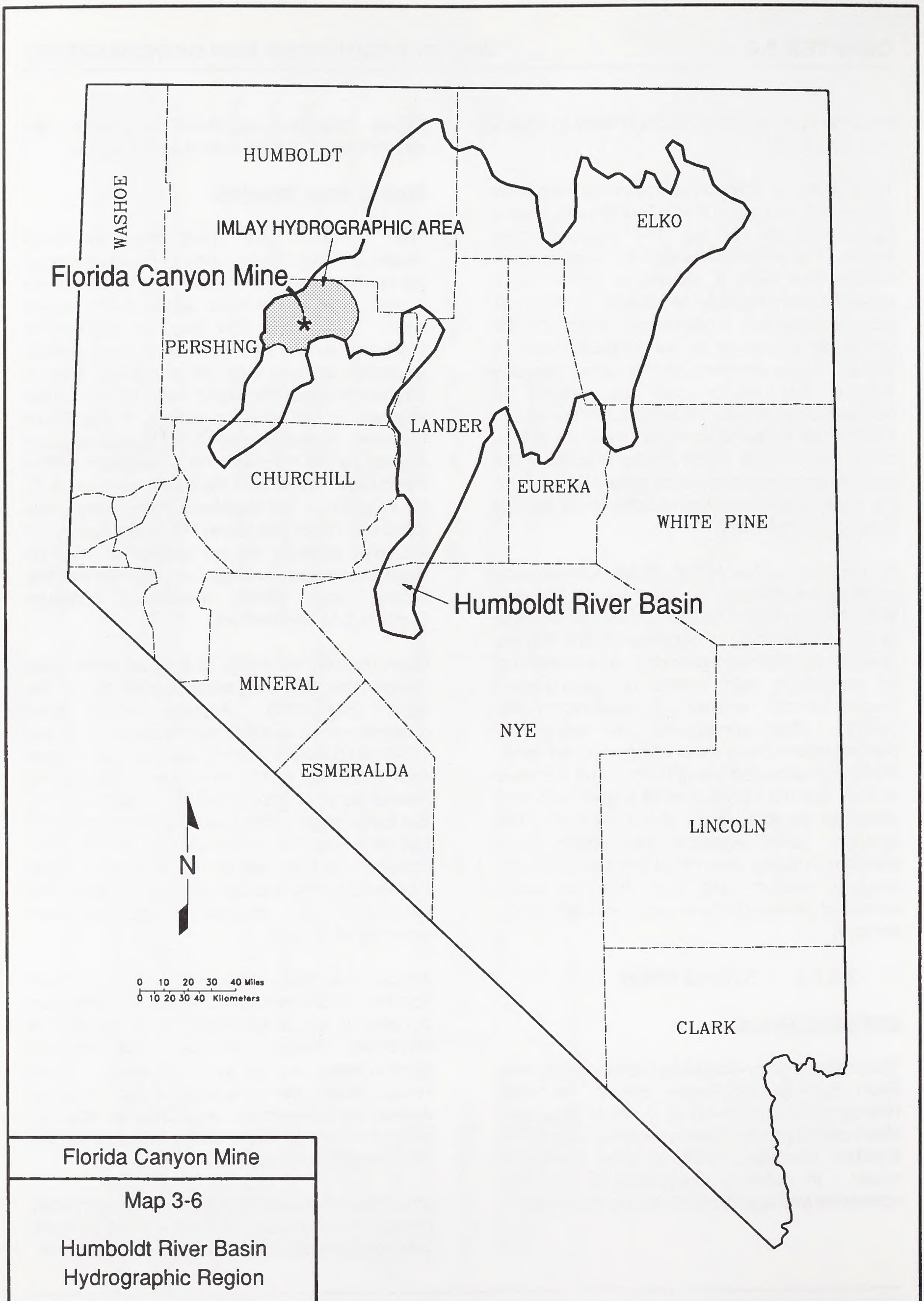
Surface Water Inventory

The Humboldt River flows into Rye Patch Reservoir about 7 miles north of the project area; the southern end of the reservoir is located about 2 miles west and 6 miles south of the project area. The general flow direction through the Imlay area is from the northeast to the southwest. A portion of flow from the Humboldt River is diverted to Upper Pitt-Taylor Reservoir, which lies adjacent to the northern portion of Rye Patch Reservoir. Approximately 16,100 square miles are drained by the Humboldt River upstream of Rye Patch Dam. Water from the river is used primarily for irrigation in the Humboldt River valley. Rye Patch and upper and Lower Pitt-Taylor Reservoirs are used primarily for the storage of irrigation water; these reservoirs also are used for boating, fishing, and other recreational activities (Section 3.11, Recreation).

Mean monthly discharge in the Humboldt River reflects the snowmelt-driven hydrology of the region (Figure 3-3). Average monthly flows upstream of the reservoir for the period of record (1946-1997) ranged from 47 cubic feet per second (cfs) in October to 770 cfs in June. Immediately downstream of the reservoir, mean monthly discharge ranged from about 38 cfs in October to 520 cfs in May prior to dam closure in 1936. After closure, monthly peaks in May and June increased to 660 and 550 cfs, respectively. The five highest flow volumes on the river were recorded after 1936.

Annual low flows prior to dam completion occurred in September and October. After dam completion, the annual low flows occurred from November through February and included approximately 3 times as much water. These results reflect the extension of the irrigation season into September and October and the storage of winter inflow to the reservoir for the following irrigation season.

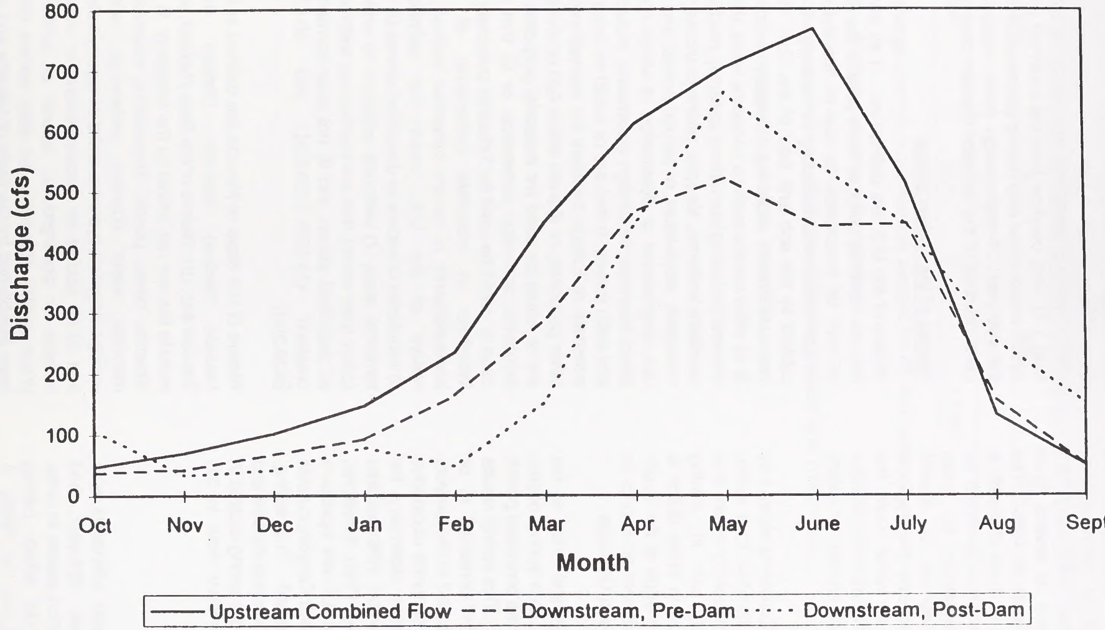
Intermittent drainages located within the proposed mine permit boundary include Florida Canyon, Johnson Canyon, Wiley Gulch, and 5 additional



Florida Canyon Mine

Map 3-6

Humboldt River Basin Hydrographic Region



Upstream Combined Flow - Sum of gaged flow at Imlay and the Upper Pitt-Taylor feeder canal;
Downstream, Pre-Dam - Records from 1896-1935;
Downstream, Post-Dam - Records from 1937-1997.

Florida Canyon Mine

FIGURE 3-3
MONTHLY MEAN DISCHARGE
HUMBOLDT RIVER NEVADA

unnamed drainages that infrequently convey surface water in response to storm events. Surface water has been observed flowing from Florida Canyon into the mine pit several times since mining operations began in 1986. The primary hydrologic function of these channels is to convey storm water from areas underlain by consolidated bedrock downslope to areas underlain by fractured bedrock or alluvial materials where it infiltrates into the regional basin-fill aquifer. Snowmelt runoff from the Humboldt Range generally infiltrates into hillslope colluvium prior to reaching the eastern boundary of the project area.

Storm water flow in Florida Canyon is slowed by a check dam before being diverted to a sump. Water drains into the pit infrequently where it is subsequently pumped for use in mining operations. Storm water flow in Wiley Gulch is diverted around the southern edge of the South Waste Rock Dump into a sediment pond prior to discharge into Johnson Canyon Drainage.

Two springs occur within several miles of the proposed permit boundary. One spring occurs about 1 mile up-stream from the proposed permit boundary in Florida Canyon. This spring results from exfiltrating groundwater contained in or flowing on top of rhyolite exposed in the canyon. Surface flow from the spring supports deciduous riparian vegetation (e.g., willow, elderberry) for several hundred feet until water infiltrates into colluvium and the underlying Prida limestone. Another spring occurs about 0.5 mile upstream from Humboldt City in Humboldt Canyon, outside of the Florida Canyon watershed. This spring, which arises from a contact between rhyolite and the Prida limestone similar to the spring located in Florida Canyon, feeds intermittent flow in the Humboldt Canyon drainage.

Flood Hydrology

Discharge from the four main tributaries was calculated for the 100-year, 300-year, and Probable Maximum Precipitation events in order to assess runoff that could affect mining operations (Hansen Allen & Luce, Inc. 1996). A summary of flood hydrology in the project area is contained in Table 3-7. Wiley Gulch is currently diverted around the east and south portions of the South Waste Rock Dump to a sediment pond located south of the growth media stockpile (see Map 1-3). Any overflow from the sediment pond, which would occur only during storms exceeding the 100-year, 24-hour design event, enters the lower reaches of the Johnson Canyon channel.

Waters of the United States

Waters of the U.S. are defined as: 1) all waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; 2) all interstate waters including interstate wetlands; 3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds; and the use, degradation or destruction of which could affect interstate or foreign commerce, including any such waters: i) that are or could be used by interstate or foreign travelers for recreational or other purposes; or ii) from which fish or shellfish are or could be used for industrial purposes by industries or foreign commerce; or iii) that are used or could be used for industrial purposes by industries in interstate commerce; 4) all impoundments of waters otherwise defined as waters of the U.S. under the definition; 5) tributaries of waters as described above; 6) the territorial seas; 7) wetlands adjacent to waters (other than waters that are themselves wetlands) as described above; and 8) not prior converted cropland (33 CFR §328.3[a], and 40 CFR §230.3[s]).

Waters of the State of Nevada are defined in the Nevada Revised Statutes, Chapter 445, Section 445.191, *Waters of the State Defined*, and include but are not limited to the following: 1) all streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems, and drainage systems; and 2) all bodies or accumulations of water, surface or underground, natural or artificial. Water quality standards for state waters have been established by the State of Nevada and are described in the NAC, Chapter 445, Sections 445.117 through 445.13976. Water quality criteria

Table 3-7

Summary of Flood Hydrology at Florida Canyon Mine[1]

Return Period	Precipitation (inches)	Wiley Gulch and Tributary	Florida Canyon	Johnson Canyon	Northern Drainage
100-year	2.7-3.1	980	620	930	450
300-year	3.2-3.6	1,240	810	1,190	570
PMP[2]	11.4	7,000[3]		---	1,860

[1]Discharge given in cubic feet per second for all drainages.

[2]PMP - Probable Maximum Precipitation.

[3]Discharge is combined discharge of Florida Canyon and Wiley Gulch.

Source: Hansen, Allen & Luce, Inc. 1996.

for drinking water were used to evaluate surface waters. These standards are listed in Table 3-8.

An assessment of jurisdictional waters of the U.S. was performed by SWCA (1997) using criteria established by the USCOE (1987). The assessment determined that approximately 10 acres of jurisdictional waters of the U.S. (9.26 acres of ephemeral channels and 0.74 acre of other waters associated with the existing gravel pit) exist within the proposed permit boundary, consisting of 5.3 acres in the currently permitted project boundary and 4.7 acres within the proposed permit boundary (Map 3-7). USCOE issued Nationwide Permit 26, permit identification number 199300562, authorizing discharges into headwaters and isolated waters. To date, 4.14 acres of waters of the U.S. have been authorized for impact within the currently permitted boundary.

__Surface Water Quality__

Because of the scarcity of surface water in the project area, there has been no monitoring of surface water quality at the mine. The U.S. Geological Survey (USGS) analyzed water quality below the spillway of Rye Patch Reservoir between 1951 and 1986, and the results of these analyses are summarized below.

In general, water from Rye Patch Reservoir is alkaline and sodium-dominated with pH between 8.0 and 8.7 standard units. The most common anions were chloride and sulfate at concentrations between 50 and 200 mg/l. Total dissolved solids generally varied between 440 and 730 mg/l, although the draining of Rye Patch Reservoir appears to have caused total dissolved solids values of 1,000 and 2,000 mg/l during 1954, 1955, and 1961. Temperatures varied between 41 and 72°F, but peak values up to 80°F have been measured. Dissolved metal concentrations were always less than 0.1 mg/l with the majority of metals well under 0.01 mg/l.

__Water Use__

The mine currently uses groundwater to supply the annual production water usage of approximately 500 to 600 million gallons. FCMI is constructing a pipeline to obtain water from Lower Pitt-Taylor Reservoir under a 5-year contract with Pershing County Water Conservation District to purchase up to 2,000 acre-feet per year (about 650 million gallons per year) with an option to renew the contract for an additional 5 years. The pipeline is being constructed on a permitted BLM right-of-way (ROW). Once the pipeline is completed, the water from Lower Pitt-Taylor Reservoir will serve as the primary mine supply for 9 months of the year and a backup supply for 3 months of the year. A 5-year supply of water for use by the mine is currently stored in Lower Pitt-Taylor Reservoir. FCMI also has permits from the Nevada Department of Water Resources to withdraw approximately 2,425 acre-feet (790 million gallons) of water per year from production wells in the project area. The production wells will serve as the primary water supply for 3 months of the year and a backup supply for 9 months of the year.

3.3.1.3 Groundwater

The proposed project area is located within the Imlay Hydrological Area in lower (western) portions of the Humboldt River Basin (Map 3-6). Hydrogeological investigation of the basin is limited to several general summary reports and maps (Eakin 1962; Thomas et al. 1986; Harrill et al. 1988) and specific water resource investigation reports performed for FCMI (Broadbent & Associates 1997, 1996a, 1996b, 1996c, 1996d, 1995; Hydro-Search, Inc. 1995, 1994, 1988a, 1988b, 1987, 1986).

Groundwater within the Imlay area is derived from infiltration of precipitation, seepage from the Humboldt River, and groundwater flow through the alluvial valley fill from upstream (Eakin 1962). Most of the local recharge to the groundwater system is from precipitation on the mountain ranges surrounding the area including the western flank of the Humboldt and East ranges and the

Table 3-8

Water Quality Criteria and Standards for Nevada

Parameter[2]	Drinking Water Standards[1]			Nevada Agriculture	
	EPA Primary	EPA Secondary	Nevada	Irrigation	Stock Water
Aluminum	--	0.05 to 0.20	--	----------	----------
Antimony	0.006	--	--	--	--
Arsenic	0.05	--	0.05	0.10	0.20
Barium	2.0	2.0	2.0	----------	----------
Beryllium	0.004	--	0	0.100	----------
Boron	--	--	--	0.750	5.0
Cadmium	0.005	--	0.005	0.01	0.05
Chloride	--	250	250 (400)[3]	----------	1500
Chromium	0.10	---	0.10	0.10	1.0
Copper	--[4]	1.0	--	0.20	0.50
Cyanide (WAD[5])	0.20	--	0.20	----------	----------
Fluoride	4.0	2.0	--	1.0	2.0
Iron	--	0.30	--	5.0	----------
Lead	--[4]	--	0.05	----------	----------
Magnesium	--	150	--	----------	----------
Manganese	--	0.05	--	0.20	----------
Mercury	0.002	--	0.002	----------	0.01
Nickel	0.10	--	0.0134	0.20	----------
Nitrate (as N)	10	---	10	----------	100
pH	--	6.5 - 8.5	5.0-9.0	4.5 - 9.0	5.0 - 9.0
Selenium	0.05	--	0.05	0.02	0.05
Sulfate	--	250	250 (500)[3]	----------	----------
TDS	--	500	500 (1,000)[3]	----------	3000
Thallium	0.002	--	0.013	----------	----------
Zinc	--	5.0	--	2.0	25

[1]The more stringent of EPA and Nevada drinking water standards for each parameter is applicable in Nevada.

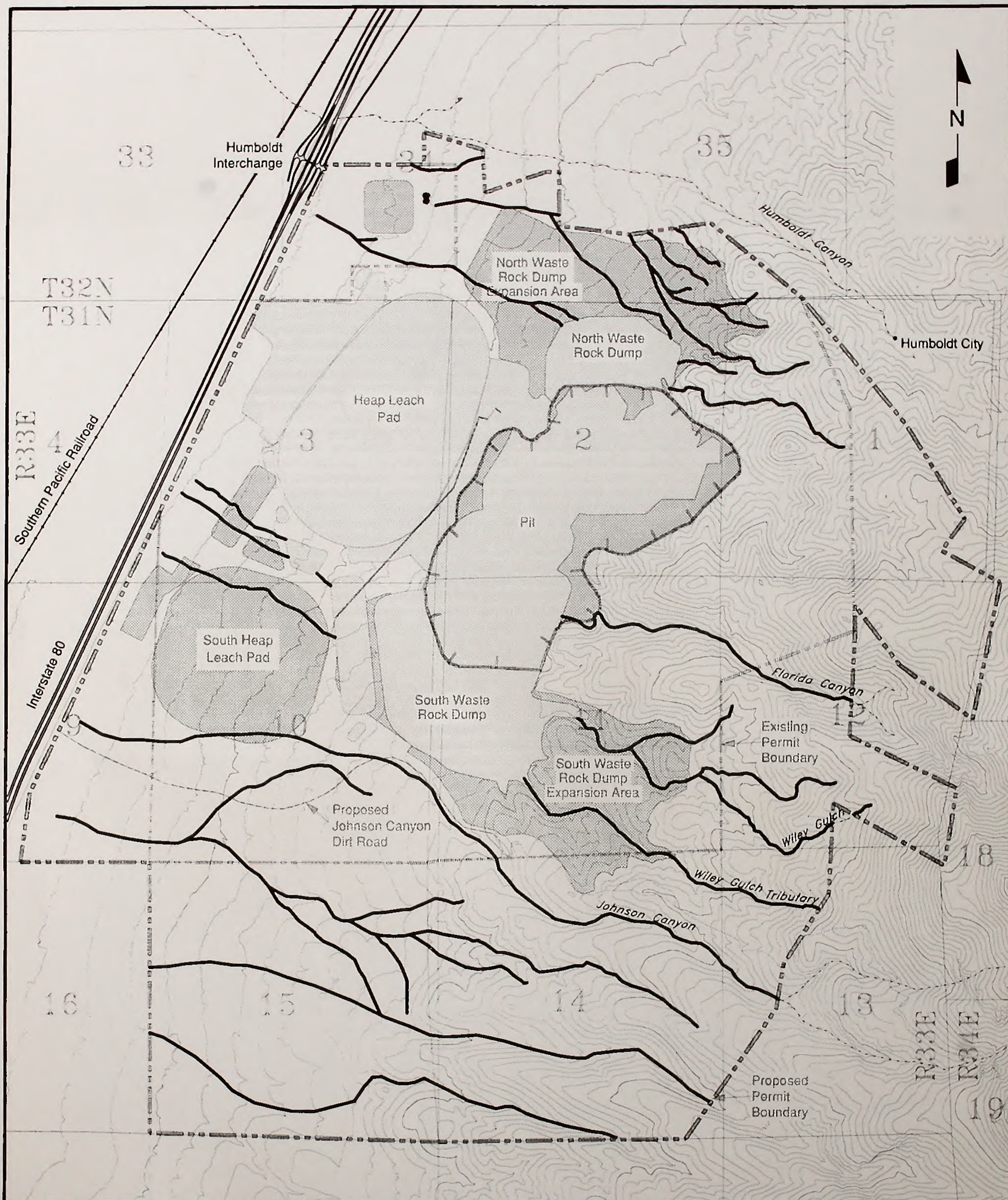
[2]Units are mg/l unless noted. SU = standard units; TDS = Total dissolved solids.

[3]Indicates numbers in ( ) are mandatory secondary standards for public water systems

[4]Action level for copper is 1.3 mg/l; action level for lead is 0.015 mg/l.

[5]WAD = Weak Acid Dissociable.

Source: Nevada (1995) LCB File No. R128-95, amendment to NAC 445.144; U.S. EPA Drinking Water Regulations and Health Advisories, February 1996.



Legend

- Existing Permit Boundary
- Proposed Permit Boundary
- Existing Johnson Canyon Unimproved Road
- Proposed Johnson Canyon Unimproved Road
- Intermittent Drainage
- Waters of the United States
- Waters of the United States
- Existing Facilities
- Proposed Action

0 1000 2000 3000 Feet

Contour Interval is 50 Feet

Source: SWCA 1996.
Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 3-7

Waters of the United States

Eugene Mountains. Groundwater occurs in both alluvial and bedrock aquifers with the greatest volume being present within the alluvium where groundwater recharge, flow, storage, and discharge are controlled by the permeability of the unconsolidated sediments. In the bedrock, porosity, permeability, and structure (i.e., faults and fractures) control the recharge, flow, storage, and discharge of groundwater. The lithology and structure beneath the project area are described in Section 3.2, Geology and Minerals.

Groundwater within the Imlay area generally flows toward the southwest along the Humboldt River. Local groundwater flow directions vary and generally follow the topographic gradient from the mountain ranges toward the Humboldt River. In general, groundwater is closest to the ground surface near the center of the area adjacent to the river and increases in depth toward the mountains (Harrill et al. 1988). Generalized groundwater depths and flow patterns for the Imlay Hydrographic Area are shown on Map 3-8.

Discharge of groundwater to the Humboldt River within the Imlay Hydrographic Area is variable, especially within the vicinity of Rye Patch Reservoir. When reservoir levels are above the surrounding groundwater levels, as typically occurs during flood flows or rising reservoir stages, the groundwater gradient slopes away from the reservoir resulting in local groundwater flow away from the reservoir. When the reservoir is low, flow direction reverses and groundwater flows toward the reservoir. Eakin (1962) estimated groundwater discharge to the river at approximately 1,000 acre-feet per year.

Bedrock

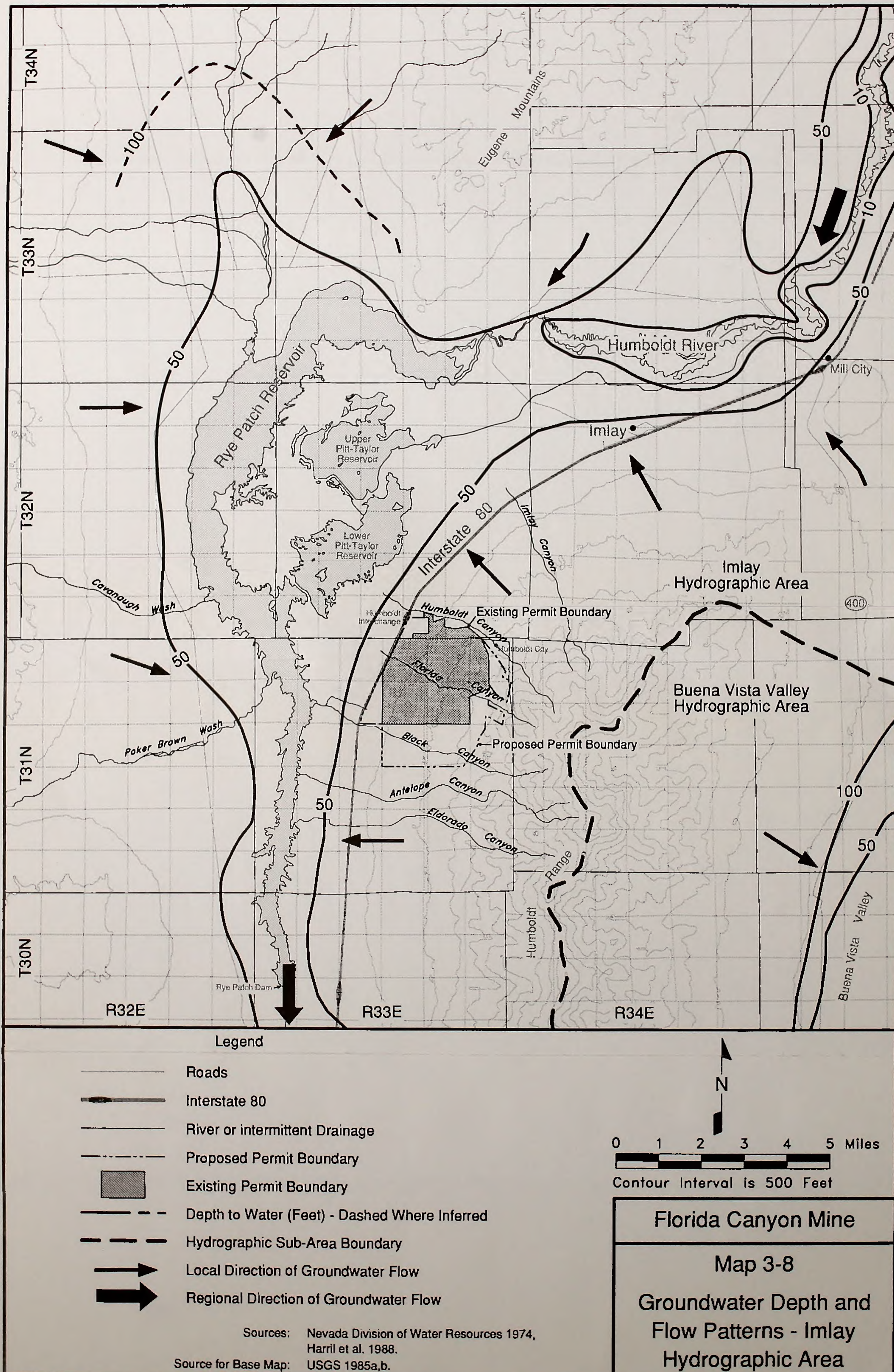
Triassic-age sedimentary and volcanic rocks form the bedrock assemblage underlying the western flank of the Humboldt Range. These rocks are tilted to the west and exposed in order of increasing age from the current mine pit east to the crest of the range. A detailed stratigraphic column is presented in Figure 3-1 (Section 3.2, Geology and Minerals). The youngest bedrock formation, the Grass Valley Formation comprised of slate, phylite, and argillite, outcrops in the walls of the pit.

Groundwater within the consolidated bedrock is generally stored and transmitted through a system of interconnected fractures or fracture networks and is possibly stored and transmitted through solution caverns and channels. Because of the broad variation of rock types and the complex pattern of fracturing related to mineralized zones, the hydraulic properties of the bedrock units are probably highly variable. Broadbent & Associates (1997) conducted a pump test on Well PW#4 located on the west side of the Phase 4 pit, which is the only mine well completed within bedrock in the area. The results of this test revealed a transmissivity of 430 gallons per day per foot (gpd/ft), which is considered representative of the fractured Grass Valley Formation in the vicinity of the pit. Elsewhere, the bedrock formations are considered to be less transmissive due to the fine-grained nature of the formations and the lack of pervasive fracturing associated with hydrothermal mineralization (Broadbent & Associates 1997). Static water levels in the vicinity of the pit were at approximate elevation 4,430 feet prior to dewatering of the current pit. The current pit water level of approximately 4,320 feet is maintained by a dewatering rate of about 70 gpm.

Alluvium

West of the current pit the mine is underlain by Quaternary-age unconsolidated alluvial valley fill comprised of silt, sand, gravel, cobbles, and boulders, which was deposited by alluvial fans, intermittent streams, and an occasional lake. The alluvium is typically coarse-grained in nature near the mountain range fronts where debris flow deposits predominate within the valley fill. Toward the center of the valley the alluvium is probably more fine-grained due to interfingering of more and thicker deposits of lacustrine sediments. The valley fill deposits are at least 550-feet-thick and possibly more than 800-feet-thick at the mine site and increase in thickness from the mountain front to the center of the valley, where they are as thick as 9,000 feet (Broadbent & Associates 1996d).

Production and monitoring wells west (downgradient) of the current and proposed heap leach facilities are completed within two



Florida Canyon Mine

Map 3-8

Groundwater Depth and Flow Patterns - Imlay Hydrographic Area

water-bearing zones within the alluvial valley fill (Broadbent & Associates 1996b). An upper aquifer is located from the ground surface to a depth of about 250 feet below which several silty clay units ranging from 50 to 100 feet in thickness. Monitoring wells at the mine are completed in the upper aquifer.

A silt and clay layer at a depth of 500 to at least 555 feet that may be partially cemented by hydrothermal dissolution apparently confines the lower aquifer, which is tapped by the mine's production wells at a depth of 600 to 780 feet. The lower "geothermal" aquifer produces brackish water at temperatures ranging from 190° to 212°F (Broadbent & Associates 1996a). The high temperature water is probably derived in part from water upwelling along the range-front fault system from a deeper geothermal source.

Broadbent & Associates (1997) conducted a pump test within the alluvium on the west side of the Phase 4 pit. Analysis of the pump test results reveal that the alluvium has a transmissivity of 550 gpd/ft, which is relatively low for an apparently coarse-grained alluvial deposit. Alluvium outcropping in the west high wall of the Phase 4 pit deposit contains boulders, cobbles, and gravel supported within a fine-grained matrix that is typical of debris flow deposits. The transmissivity is more representative of the fine-grained matrix than of the coarse material.

Fault Zones

Faults can act as either barriers or conduits to groundwater flow. The influence of faults on groundwater flow is dependent on the physical and lithological characteristics of the rock. Faulting of softer, less competent rocks can form crushed and pulverized rock (fault gouge), which would act as a barrier to groundwater flow. Mineralization along faults also can reduce or prevent the transmission of water. Faulting of harder, more competent rock can create conduits that allow higher groundwater flow and storage than surrounding unfaulted rock.

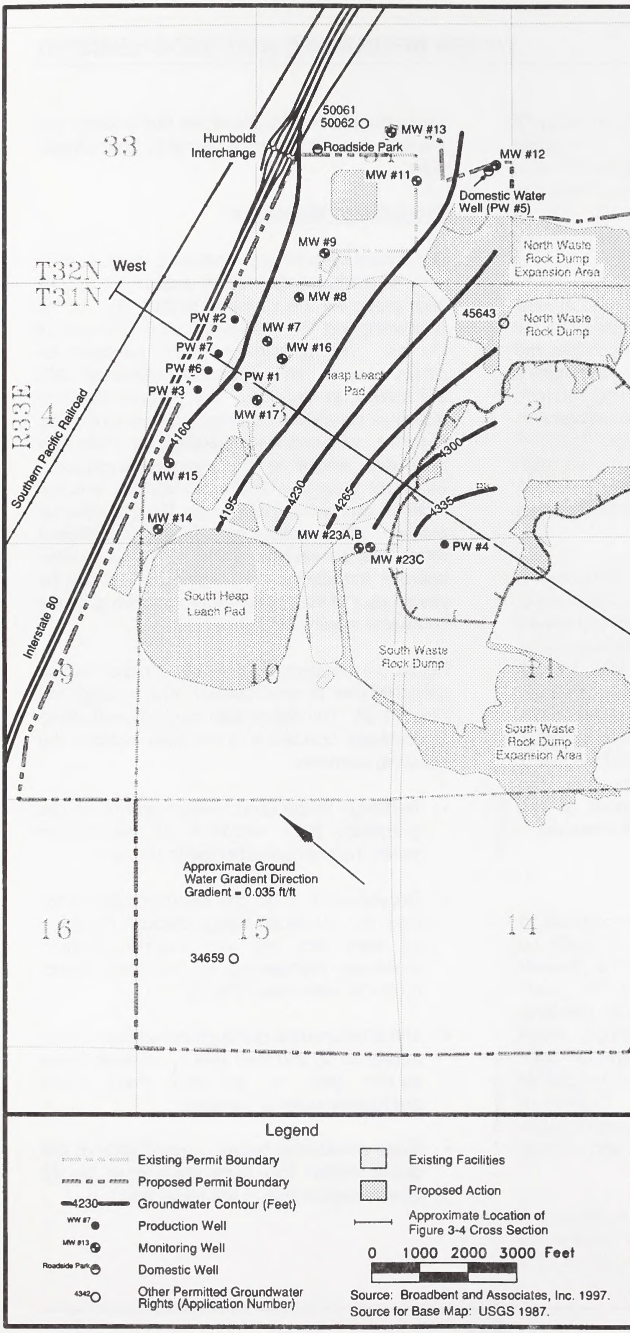
During the pump test of well PW #4, Broadbent & Associates (1997) monitored water levels in the alluvial well (MW-23C) located west of the range-front fault. Results of the test indicate that the fault does not act as a barrier to groundwater flow.

Groundwater Movement

Groundwater levels are monitored in production and monitoring wells located west of the current and proposed heap leach facility and in the producing well PW #4 on the west high wall of the pit. The groundwater level contours for observed water table elevations in October 1995 are shown on Map 3-9. The groundwater flow direction, consistent with regional flow directions, is to the west-northwest towards the Humboldt River and parallel to the topographic gradient. Below the proposed heap leach facilities, process facilities, and waste rock dumps, the groundwater resides within the alluvium, whereas groundwater within the pit resides within the Grass Valley bedrock formation. An upgradient well will be placed east of the Phase 4 Pit to confirm gradient and water quality within the bedrock.

Figure 3-4 presents a generalized cross-section perpendicular to groundwater flow through the Phase 4 pit. The conceptual model summarizing groundwater conditions at the mine includes the following elements:

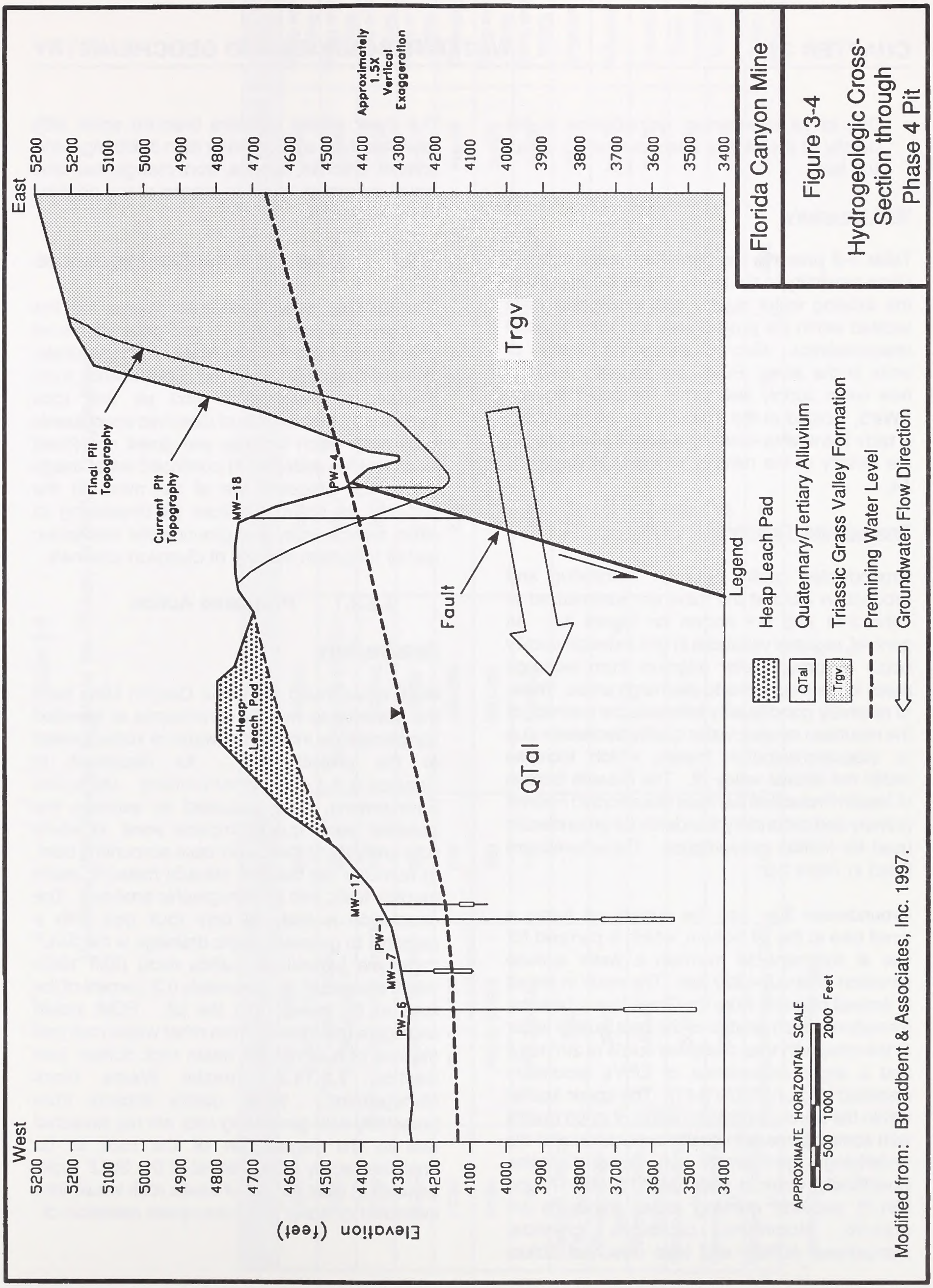
- Recharge to the groundwater system occurs principally from infiltration of precipitation within the Humboldt Range to the east;
- Groundwater within the bedrock flows west from the Humboldt Range through the mine pit area and into the shallow alluvium eventually discharging to the groundwater reservoir within the valley fill;
- The alluvium west of the pit includes an upper aquifer (0 to 250 feet) and a confined lower aquifer (600 to 800 feet) from which production water is pumped;
- Since dewatering began, groundwater in the upper aquifer has been intercepted by pit dewatering for use at the mine; and



Florida Canyon Mine

Map 3-9

Water Table Elevations and Well Locations, October 1995



Florida Canyon Mine

Figure 3-4
Hydrogeologic Cross-Section through Phase 4 Pit

- Due to pit dewatering, groundwater in the vicinity of the pit has been lowered by about 100 feet.

Well Inventory

Table 3-9 presents the permitted water rights in close proximity to the mine. Table 3-10 presents the existing water supply and monitoring wells located within the project area and their physical characteristics. Map 3-9 shows the location of wells in the area. FCMI also recently drilled a new water supply well within the upper aquifer, PW#5, located at the northern permit boundary. A table identifying water right permits and uses in the vicinity of the mine is provided in Appendix A4.

Groundwater Quality

Groundwater quality data for monitoring and production wells at the mine are summarized in Table 3-11 and are shown on Figure 3-5. In general, regional variations in groundwater quality occur as groundwater migrates from recharge areas in the mountains to discharge areas. Water of relatively good quality infiltrates the bedrock of the mountain ranges; water quality decreases due to evapotranspiration losses, which increase within the alluvial valley fill. The Nevada Bureau of Health Protection Services has adopted Federal primary and secondary standards for groundwater used for human consumption. These levels are listed in Table 3-8.

Groundwater flow into the current pit forms a small lake at the pit bottom, which is pumped for use at the mine to maintain a water surface elevation of about 4,320 feet. The water in the pit is derived primarily from the Grass Valley bedrock formation, which produces the best quality water at the mine with total dissolved solids of 207 mg/l and a slight exceedence of EPA's secondary standard for iron (Table 3-11). The upper aquifer within the alluvium contains water of good quality with some decrease in quality associated with the underlying geothermal or lower aquifer. Specifically, water in wells (MW-16, MW-17, and MW-7) exceeds drinking water standards for arsenic, aluminum, cadmium, chloride, manganese, sulfate, and total dissolved solids. The lower aquifer contains brackish water with total dissolved solids greater than 3,000 mg/l and arsenic, chloride, fluoride, iron, manganese, and nickel present at levels in excess of the drinking water standards.

3.3.2 Environmental Consequences

The primary water resources issues for the Proposed Action include: 1) acid generation from overburden materials and waste rock materials; 2) mobilization of dissolved constituents from overburden, waste rock, and pit wall rock materials; 3) mobilization of dissolved constituents from heap leach facilities and spent ore (heap leach residue material), 4) continued water usage during the proposed life of the mine; 5) the potential for drawdown from pit dewatering to effect surface water and groundwater resources; and 6) long-term stability of diversion channels.

3.3.2.1 Proposed Action

Geochemistry

Rock types found at Florida Canyon Mine have the potential to release constituents at elevated concentrations into groundwater or surface water at the project site. As discussed in Section 3.3.1.1, Geochemistry (Affected Environment), data evaluated to estimate the potential water quality impacts were: 1) whole rock analysis, 2) static acid-base accounting data, 3) humidity cell tests, 4) Nevada meteoric water mobility tests, and 5) petrographic analyses. The conclusion is that the only rock type with a potential to generate acidic drainage is the SULF rock type (unoxidized sulfide rock) (SMI 1997) which comprises approximately 0.2 percent of the rock to be mined from the pit. FCMI would segregate this material from other waste rock and dispose of it within the waste rock dumps (see Section 2.2.14.3, Special Waste Rock Management). Water quality impacts from potentially acid generating rock are not expected due to the segregation of the rock to be implemented by FCMI. Burial of the SULF rocks beneath at least 50 feet of waste rock would limit infiltration of water and subsequent oxidation of

Table 3-9

Permitted Groundwater Rights in the Vicinity of Florida Canyon Mine

Owner	Well Name; Permit #	Total Depth	Screened Interval (ft)	Annual Duty[1]	Depth to Water (ft)	Well Head Elevation	Date Permitted	Use
FCMI	PW-1; 48998, 62380T,57097	599	495-595	159.0	121	-	Jun-88	Milling and Mining
FCMI	PW-2; 48997, 61203, 57096, 62381T	568	368-508 and 528-548	105.4	107	4268.29	Feb-88	Milling and Mining
FCMI	PW-3; 48999, 53342, 57098	780	400-780	135.8	-	-	Aug-94	Milling and Mining
FCMI	PW-4; 49931, 62383T	235	55-235	21.7	33.4	4465.34	Oct-94	Milling and Mining
FCMI	PW-5; 61707	576	436-566	23.6	277	4475 est	Aug-96	Domestic
FCMI	PW-6; 61643	780	580-780	151.5	130	4275 est	Apr-96	Milling and Mining
FCMI	PW-7; 61644	740	540-740	158.5	137	4275 est	Jun-96	Milling and Mining
Campbell, Clayton C.; Campbell,	4342	-	-	112.4	-	-	Mar-17	Irrigation
Western State Geothermal	34659	-	-	1179.5	-	-	Nov-77	Industrial
Western State Geothermal	45643	-	-	235.9	-	-	Nov-81	Industrial
Campbell, Charlotte M.	50061	-	-	1.02	-	-	Aug-86	Quasi-municipal
Campbell, Charlotte M.	50062	-	-	3.29	-	-	Aug-86	Quasi-municipal
Campbell, Charlotte M.	RoadsideTrailer Park; 50248	140	120-140	1.41	85	4300	Oct-86	Quasi-municipal

[1] Annual Duty in Million Gallons per Year (mga)

Table 3-10

Physical Characteristics of Existing Water Supply and Monitoring Wells at Florida Canyon Mine

Well Name[1]	Total Depth	Screened Interval (ft)	Depth to Water (ft)	Well Head Elevation	Date Drilled
PW-1	599	495-595	121	-	Jun-88
PW-2	568	368-508 and 528-548	107	4268.29	Feb-88
PW-3	780	400-780	-	-	Aug-94
PW-4	235	55-235	33.4	4465.34	Oct-94
PW-5	576	436-566	277	4475 est	Aug-96
PW-6	780	580-780	130	4275 est	Apr-96
PW-7	740	540-740	137	4275 est	Jun-96
MW-8	170	137-170	135	4306.21	Dec-93
MW-9	170	137-170	140	4306.49	Dec-93
MW-10	720	540-720	378	-	Mar-95
MW-11	260	210-250	190.5	4376	Aug-95
MW-12	380	335-375	266.83	4477.8	Aug-95
MW-13	200	150-190	164.35	4332.9	Aug-95
MW-14	240	190-230	177.28	4335.7	Aug-95
MW-15	200	150-190	148.87	4308.11	Aug-95
MW-16	240	185-225	164.35	4328.6	Sep-95
MW-17	300	220-260	190.5	4345.4	Sep-95
MW-23A	618	200-600	309.48	4715.32	Dec-96
MW-23B	600	300-600	297.27	4714.07	Dec-96
MW-23C	540	200-500	303.36	4714.45	Dec-96

1 'PW' refers to production well for water supply; 'MW' refers to monitoring well.

Table 3-11

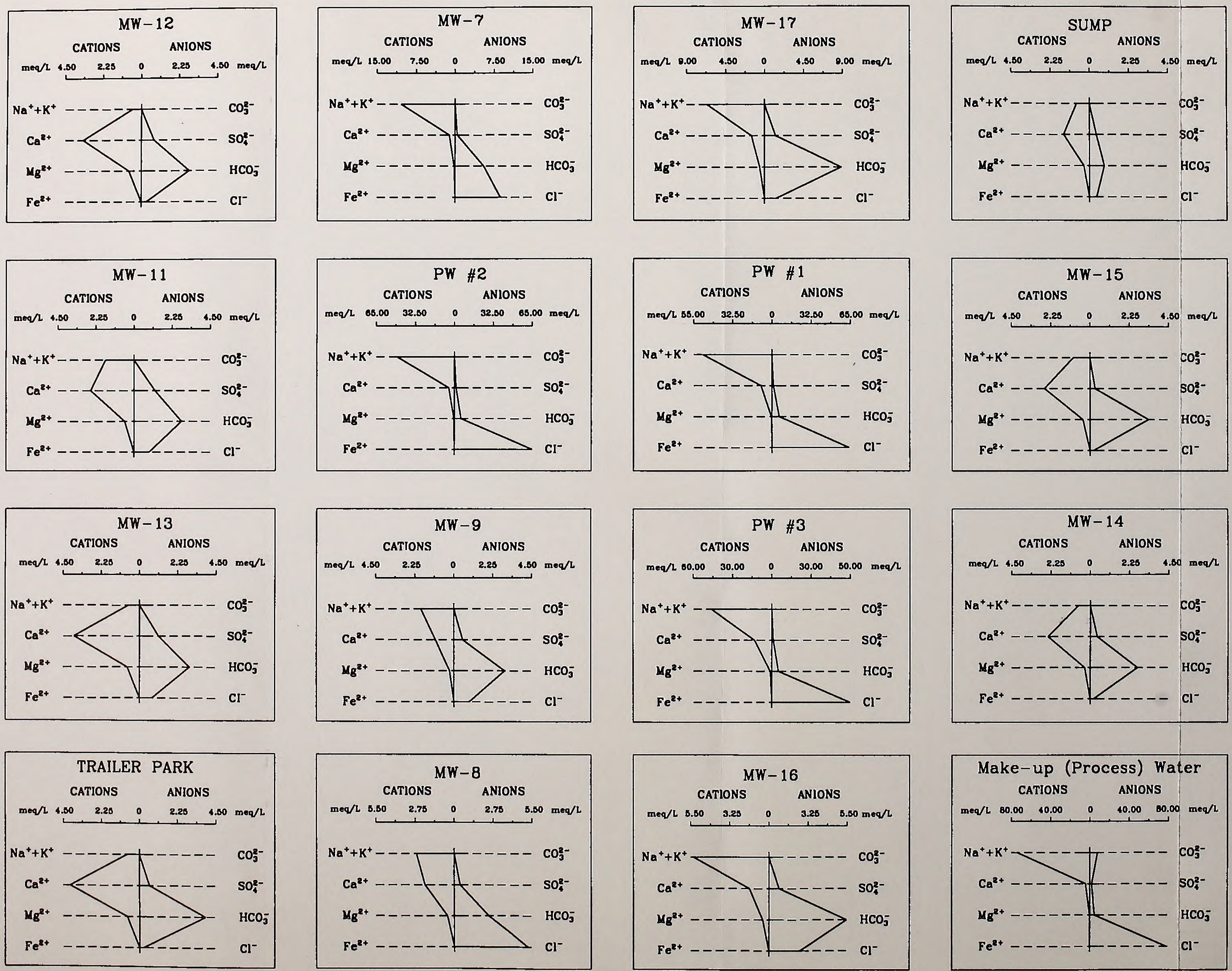
Water Quality at Florida Canyon Mine: 1994-1996

		MW-7	MW-8	MW-9	MW-11	MW-12	MW-13	MW-14	MW-15
DATE(S)[2]	Drinking Water Standard[3]	2/3/94; 5/2/94; 8/11/94	1/11/94; 2/1/94; 3/17/94; 4/20/94	1/11/94; 2/1/94; 3/17/94; 4/20/94	9/8/95	9/8/95	9/8/95	9/8/95	9/8/95
Alkalinity (Total)		278-329	122-135	140-155	140	143	148	135	168
Aluminum	0.05 - 0.2		<0.001-0.447	<0.001-0.176					
Antimony	0.006		<0.120	<0.120					
Arsenic	0.05	<0.002-0.029	<0.002-0.034	0.006-0.040	<0.020	<0.020	<0.020	<0.020	<0.020
Barium	2	<0.01-0.67	<0.10-0.93	<0.10-0.92	<0.10	<0.10	<0.10	0.28	0.2
Berryllium	0.004		<0.005	<0.005					
Bismuth			0.022-<0.150	0.080-<0.150					
Boron					0.12	0.06	0.08	0.08	0.06
Cadmium	0.005	<0.005	<0.005	<0.005					
Calcium		22.3-52.0	41.2-45.5	21.4-29.3	50.9	68.6	77.3	48.3	51.9
Chloride	250 - 400	260-312	123-184	30-41	31	10	26	8	8
Chromium	0.1	<0.050	<0.050	<0.500					
Cobalt			<0.050	<0.050					
Copper	1.0 - 1.3	<0.005-0.009	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050
Flouride	2.0 - 4.0	0.72-1.60	<0.005-0.76	0.07-0.64	<1.00	<1.00	<1.00	<1.00	<1.00
Gallium			0.015-<0.300	<0.300					
Iron	0.3 - 0.6	<0.03	<0.05	<0.05					
Lead	0.015	<0.015	<0.050	<0.050					
Lithium			0.207-0.262	0.117-0.171					
Magnesium	125 - 150	2.42-2.77	5.75-6.14	3.04-3.43	6.6	8.7	8.6	3.7	4.8
Manganese	0.05 - 0.01	<0.006	<0.005-0.052	<0.006	0.07	<0.050	<0.050	<0.050	<0.050
Mercury	0.002	<0.0002-0.0002	<0.0002-0.0015	<0.0002-0.0013					
Molybdenum			0.017-<0.100	0.006-<0.100					
Nickel	0.01		<0.040	<0.040					
Nitrate (total)	10	<0.05-0.70	<0.01-0.44	<0.01-0.19	<1.00	1.8	1.8	<1.00	<1.00
pH	6.5 - 8.5	7.49-8.03	7.78-8.61	7.77-8.24	6.86	6.95	6.98	6.86	6.86
Phosphorous			<0.05	<0.05					
Potassium		10.5-21.7	6.9-17.3	4.0-11.4	13	1	2	4	3
Scandium		<0.002-0.023	<0.150	<0.015					
Selenium	0.05		<0.002-0.027	<0.002-0.031	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	0.1	<0.020	<0.020	<0.020					
Sodium		217.0-295.0	56.9-85.5	41.7-71.5	31	11	14	13	20
Strontium			0.29-0.42	0.26-0.45					
Sulfate	250 - 500	17.3-28.5	20.3-38.0	24.9-52.6	59.2	35.7	54	19.1	14.4
Thallium	0.002		<0.100	<0.100					
Tin			<0.80	<0.80					
Titanium			<0.40	<0.40					
TDS (calc)	500 - 1000	760-894	371-457	215-330	391	336	388	300	340
Vanadium			0.023-<0.300	0.026-<0.300					
WAD Cyanide	0.2	<0.005	<0.005-0.014	<0.005-0.012					
Zinc	5	<0.015	<0.015	<0.015	<0.100	<0.100	<0.100	<0.100	<0.100
Bicarbonate (HCO3)					171	174	180	165	204
SiO2					28	25.1	24.1	39.8	34.4
Hardness (CaCO3)					154	207	229	136	149
Ec (umhos/cm)					520	420	490	340	340

Table 3-11 (Continued)

	MW-16	MW-17	Trailer Park	PW-1	PW-2	PW-3	Pit Sump	PW-5	Process or Make-up Water[4]
DATE(S)[2]	9/12/95; 10/2/95	9/12/95; 10/2/95	4/11/95	1st Quarter, 1994	1st Quarter, 1994	1st Quarter, 1994	10/11/94	9/9/96	5/25/95, 5/29/96
Alkalinity (Total)	322-323	321-441	195	302	278	250	76	158	336-387
Aluminum	0.042-0.193	0.138-0.170	<0.005				0.007		0.051 ('96)
Antimony	<0.003-0.010	0.004-0.097	<0.004				<0.050		<0.003
Arsenic	0.015-0.089	0.008-0.047	<0.002	0.124	0.101	0.08	0.049	0.021	0.092-0.178
Barium	0.22-0.24	0.06-0.10	0.13	1.22	<0.10	1.11	0.14	0.12	0.389-0.596
Berryllium	<0.002	<0.002	<0.001				<0.005		<0.005
Bismuth	<0.012	<0.012	<0.012				<0.012		
Boron									
Cadmium	<0.002-0.012	<0.002-0.002	<0.001	<0.005	<0.005	<0.005	<0.001		<0.005
Calcium	25.2-32.2	23.5-30.0	81.9	182	93.3	262	41.6	62.5	81.3-94.7
Chloride	43-91	47-238	8	2262	2304	2127	33	15.6	2658-2978
Chromium	<0.005	<0.005	<0.005	<0.050	<0.050	<0.050	<0.020		<0.005
Cobalt	<0.005-0.008	<0.005	<0.003				<0.050		
Copper	<0.005	<0.005-0.024	0.093	<0.020	<0.020	<0.020	0.138	<0.05	<0.005-0.032
Flouride	0.46-0.85	0.26-0.56	0.6	3.65	3.81	3.15	0.21	0.5	4.5-5.6
Gallium	<0.010-0.035	<0.010-0.032	0.007				<0.007		
Iron	0.10-0.18	0.10-0.22	<0.002	0.17	0.38	0.21	0.54	<0.10	<0.01-0.125
Lead	0.006-0.012	0.018-0.024	<0.004	<0.015	<0.015	<0.015	<0.005		<0.01-0.021
Lithium	0.069-0.227	0.028-0.164	0.176				<0.005		
Magnesium	4.6-6.4	5.1-6.6	8.8	6.3	5.6	14.1	4.2	10.6	6.82-7.58
Manganese	0.035-0.468	0.021-0.042	<0.002	0.169	0.173	0.161	0.012	<0.05	0.088-0.096
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	0.0019	0.001	<0.0002		<0.0002
Molybdenum	0.005-0.024	0.011-0.082	0.006				0.005		
Nickel	<0.006	<0.006	<0.006	0.221	0.147	0.177	<0.005		<0.006
Nitrate (total)	0.03-0.05	0.02-0.14	0.12				0.32	1.3	<0.02-0.07
pH	7.29-7.44	7.28-8.37	7.63	7.49	7.59	6.98	6.85	7.48	8.04-8.07
Phosphorous	<0.02-0.16	<0.02-0.05	<0.02				<0.01		
Potassium	11.9-13.6	32.8-140.0	1.3	188	120	92	1.7	4	251-288
Scandium	<0.002	<0.002	<0.002				<0.150		
Selenium	<0.002	<0.002	0.016	<0.002	<0.002	<0.002	0.003		<0.005-0.021
Silver	<0.005	<0.005	<0.005	<0.020	<0.020	<0.020	<0.025		<0.005
Sodium	124.0-136.0	134.0-247.0	15.7	1210	1025	1011	22.7	24	1430-1713
Strontium	0.15-0.21	0.22-0.51	0.42				0.13		
Sulfate	35.1-40.3	60.7-278.0	28.2	57.5	68.4	55.24	30.6	32.4	36.6-40.8
Thallium	<0.001	<0.001	<0.041				<0.005		<0.002
Tin	<0.02	0.07-0.12	<0.02				<0.02		
Titanium	<0.01	<0.01	<0.01				0.02		
TDS (calc)	470-520	505-1055	215	4199	3830	3630	207	375	4336-5420
Vanadium	<0.002-0.023	<0.002-0.012	0.009				0.002		
WAD Cyanide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		<0.005-0.017
Zinc	<0.002-0.038	0.006-0.032	0.425	<0.015	<0.015	<0.015	0.965	<0.10	0.009-0.114
Bicarbonate (HCO3)								192.2	336 ('96)
SiO2								31.8	
Hardness (CaCO3)								200	
Ec (umhos/cm)								450	

[1] All constituents in mg/l except pH (standard units) and electrical conductivity (umhos/cm).
[2] Minimum and maximum values are presented for wells with multiple sampling days.
[3] Drinking Water Standards are EPA Primary or Nevada State Standards
[4] Data for process or make-up water includes water from production wells # 1, 2, 3, 6, and 7.



Source: Broadbent and Associates, Inc. 1997.

Florida Canyon Mine

Figure 3-5

Stiff Diagrams of Water Quality in wells at the Project Area

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acid generating rock which requires the presence of both water and oxygen. The following paragraphs describe the potential impacts due to backfilling of the pit and seepage through the waste rock.

Pit Backfill. As part of the final reclamation under the Proposed Action, FCMI would partially backfill the open pit to a level above the premining water table. This would eliminate the potential for development of a permanent pit lake upon mine closure. The backfill would be comprised primarily of alluvium (79 percent) with minor amounts of the silicic (15 percent), hematitic (3 percent), and clay (3 percent) alteration types. It is anticipated that groundwater levels would recover to near premining levels, thereby saturating the backfill and introducing the potential for dissolution of constituents from the backfill into the groundwater.

SMI (1997) conducted a series of column leach tests to determine whether the pit backfill would have an impact on groundwater quality. Column testing was conducted on a composite of the proposed pit backfill in the sequence and portions to be placed up to the elevation of the premining water level (about 4,430 feet). Groundwater from the site was pumped through the sample until the effluent stabilized chemically (12 days). Effluent from the column was collected on a daily basis for analysis of sulfate, electrical conductivity, and pH. Samples collected after the first and last days of the test and the sample with the highest pH were analyzed for Nevada Profile II metals. The results (see Appendix A5) indicate that the effluent from the column test, particularly the final week effluent which may represent an estimate of the quality of groundwater exiting the pit backfill, is similar in quality to existing groundwater (SMI 1997). Therefore, no impacts to groundwater quality are expected as a result of backfilling of the pit with waste rock from the mine.

Waste Rock Seepage. Waste rock dumps at the project area have the potential to produce seepage that may be degraded in quality due to dissolution of constituents from the waste rock. A seepage modeling analysis by SMI (1997) indicates that virtually no seepage is expected to discharge from the combined waste rock mass (North and South Waste Rock Dumps) at the mine. The modeling was conducted using the HELP, OPUS, and UNSAT2 models to estimate, respectively, precipitation trends, infiltration rates, and transient unsaturated flow conditions. Modeling assumptions include normal climatic conditions during placement of waste rock, adequate control of surface flow to ensure that runon to the waste rock is diverted around the facilities, 12-inch topsoil cover, and sustainable native vegetation on the reclaimed waste rock surface. The long-term seepage rates are estimated by SMI (1997) to range from 0.3 gpm to 4.1 gpm with a seepage rate as high as 7.2 gpm under unfavorable runoff and vegetative conditions. A year after completion of reclamation seepage rates are expected to be negligible until moisture infiltrating through the reclamation surface reaches the bottom of the waste rock dumps more than 500 years after reclamation. Water quality impacts from the waste rock dumps are not expected due to the low rate of seepage, the non-acid generating nature of rock from the mine, the attenuation capacity of the alluvium, depth to groundwater, and the special waste rock management plan.

<u>Surface Water Impacts</u>

Impacts to ephemeral drainage channels, considered other waters of the U.S., would accrue from fills related to expansion of the South Waste Rock Dump (1.1 acres), the diversion of Florida Canyon drainage from the pit following pit closure, and construction of the South Heap Leach Pad (0.3 acre) and the south process area and sediment pond (0.1 acre). Construction of a sediment pond in the gravel pit at the north end of the site will disturb 0.8 acre of jurisdictional waters. Expansion of the North Waste Rock Dump will disturb 0.7 acre. In addition, temporary disturbance to approximately (0.1 acre) of ephemeral channels would result from 37 channel crossings by proposed exploration roads. Total disturbance to potential jurisdictional waters of the U.S. is approximately 3.1 acres. Reclamation of drainage features and exploration road crossings following mine closure would restore native vegetation within ephemeral channels, and the hydrologic functions of these channels would be unchanged.

The Proposed Action includes diversion of major drainage channels around mine operations. Runoff from the North and South Waste Rock Dumps would be captured and diverted to sediment ponds for detention. Water entering the sediment ponds would evaporate and infiltrate into valley sediments. The Florida Canyon Channel would be re-established through the backfilled reclaimed pit.

The Wiley Gulch Diversion that currently prevents run-on of precipitation onto the South Waste Rock Dump would be realigned as would the Johnson Canyon Drainage. Drainage from the Wiley Gulch Diversion would be directed to the South Sediment Pond. The Johnson Canyon Diversion would route storm water around the south boundaries of the South Waste Rock Dump and the South Heap Leach Pad. Storm water in this diversion would discharge into an existing drainage and infiltrate into the alluvial materials in the valley.

A channel would be constructed to re-establish the Florida Canyon Drainage. Water flowing down Florida Canyon during a storm event would flow over a bedrock drop 225 vertical feet. The channel would then traverse the pit backfill at a 5 percent slope. The riprapped channel would then traverse a portion of the south waste rock dump. After emerging from the waste rock dump, the channel with 3H:1V side slopes would continue to the west to merge with the Wiley Gulch Diversion channel and flow into the South Sediment Pond.

These diversion channels and sediment ponds have been designed to withstand a 100-year, 24-hour precipitation event with enough freeboard to hold a 300-year, 24-hour precipitation event. The probable maximum precipitation event was used to design the emergency spillways for the proposed sediment ponds.

Re-establishment of the Florida Canyon channel has the potential to impact the stability of post-reclamation topography. The creation of a steep, bedrock channel at the inflow to the reclaimed pit has the potential to initiate upstream migration of a nickpoint, resulting in channel erosion within undisturbed portions of the watershed. This potential would be minimized or alleviated by the presence of bedrock control in the bottom of Florida Canyon. Over the long-term, there is a potential for filling and subsequent over-topping of the re-established Florida Canyon channel. Failure of the channel would result in discharge of Florida Canyon flows into the backfilled pit.

Under the Proposed Action, water use would continue at a maximum rate of approximately 2,000 acre-feet per year for an additional 10 years (through reclamation). This would result in a combined water usage from Lower Pitt-Taylor Reservoir and groundwater over the life of the mine of 20,000 acre-feet. The Lower Pitt-Taylor Reservoir system currently holds sufficient water volumes to provide water to the mine (2,000 acre-feet per year under a 5-year contract with Pershing County Water Conservation District) without additional diversions of water from the Humboldt River. If the contract is renewed for an additional 5 years under an existing contract option, additional diversions from the Humboldt River averaging about 2,000 acre-feet per year would occur. If the contract is not renewed, the mine would obtain all water from groundwater wells at the mine site. However, the use of poor quality geothermal water for heap rinsing would extend the rinsing time by a factor of about two.

<u>Groundwater Impacts</u>

Groundwater may be impacted by seepage from the heap leach facility, seepage from waste rock dumps, dewatering of the pit during mining operations, and by release of dissolved constituents from the pit backfill material, which would be saturated by groundwater following reclamation. In addition, there is a potential for depletion of groundwater recharge to Rye Patch Reservoir on the Humboldt River located about 3 miles west of the mine.

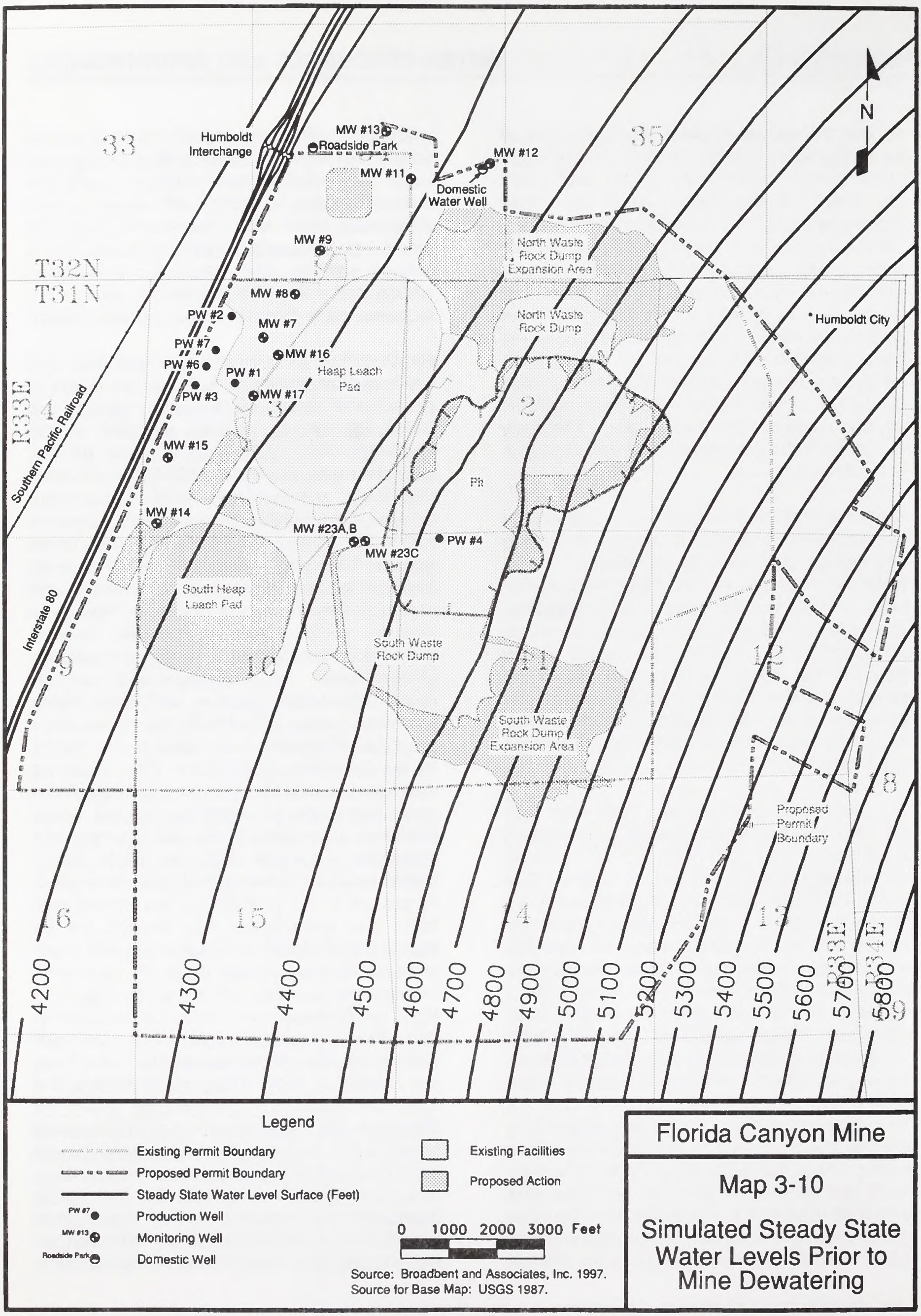
Heap Leach Facility. Details regarding the design and construction of the heap leach facility are provided in Chapter 2.0 of this EIS and in the Amended Plan of Operations. The heap leach facility would be designed to be a zero-discharge facility with the capacity to contain all process fluids and meteoric waters generated by the

25-year, 24-hour storm event. The system would be designed to contain a 24-hour draindown resulting from power loss. Storm flows from upgradient catchment areas would be routed around the facility by a diversion ditch system that has been designed to pass the 100-year, 24-hour storm event. The leach pad would utilize a composite-lined system with leak detection. The leach pad also would be equipped with a leak detection/collection system placed under the primary liner beneath the collection pipes in each cell of the leach pad. Leak detection for the leach pad would include separate monitoring systems for each cell of the leach pad. Therefore, contamination of groundwater by leach solution is not anticipated.

Reclamation procedures for the heap leach facility incorporate ore and solution characteristics, site conditions, and climatic conditions. The reclamation phases for the heap leach facility include: heap rinsing; heap grading, topsoiling, and vegetation; rinse solution management; and pond reclamation. A detailed permanent closure plan for the heap leach facilities would be submitted to the NDEP 2 years prior to closure, as required by Nevada Administrative Code 445.24386 and Nevada Administrative Code 445.14338.

The heap would be rinsed with fresh water until the weak acid dissociable cyanide concentration is 0.2 mg/l or less, a pH of 6.0 to 9.0 is obtained, and the effluent does not degrade waters of the state. It has been estimated, based upon column testing in 1995, that approximately 4 years may be required to completely rinse and drain the approximate 60-million-ton proposed South Heap Leach Pad. Approximately the same time is estimated to rinse and drain the existing heap leach pad. If fresh water from Lower Pitt-Taylor Reservoir is not available, then rinsing with the back-up geothermal groundwater supply would require approximately twice as much time. If neutralization by rinsing does not achieve the required closure criteria, then FCMI would submit a proposal to the NDEP for an alternative heap leach pad closure method. The heap would be graded to eliminate the benches, to reduce the side slopes to a maximum 3H:1V grade, and to round off the heap edges to more natural contours. A minimum 1-foot thickness of suitable growth media would be placed on the graded heap. After application of the growth media, the heap would then be seeded with an appropriate reclamation seed mix. Placement of growth media, grading, and vegetating would inhibit surface ponding and infiltration of meteoric waters, and reduce the potential erosion of the reclaimed pads (Broadbent & Associates 1995a).

Pit Dewatering. Groundwater modeling was performed by Broadbent & Associates (1997) to predict the extent of drawdown due to pit dewatering and to estimate depletion to the Humboldt River. The model used for the simulation was the USGS MODFLOW 88 code (McDonald and Harbaugh 1988). Maximum pumping rates and dewatering rates are estimated to be 370 gpm. The model was run under transient flow conditions to simulate the mine life (through the year 2001) and to determine the maximum lateral extent of drawdown during the recovery period. Input parameters included recharge in the Humboldt Range and hydraulic characteristics (transmissivity and storage coefficient) for the alluvium and Grass Valley formations. Map 3-10 shows the steady state groundwater elevations simulated by the model for the premining condition (i.e., prior to any pit dewatering activities). The maximum predicted drawdown at the pit would be 288 feet below premining water levels at the end of mining and dewatering in the year 2002 (Map 3-11). Water levels in the pit are predicted to recover to within 90 percent of the premining levels by the year 2032, and groundwater flow through the pit backfill is predicted to return to the premining rate of about 46 gpm. Water levels at the end of mining and dewatering are shown on Map 3-12. Map 3-13 shows the maximum extent of drawdown as depicted by the 5-foot drawdown contour 31 years following cessation of mining and dewatering (Year 2033). Water levels at the maximum extent of drawdown are shown on Map 3-14. The 5-foot drawdown contour extends about 1 mile south of the existing permit boundary (within the proposed permit boundary), less than one-half mile east of the permit boundary, and remains within the permit boundary to the north and west. The nearest water supply well, PW#5, is owned by the mine


Humboldt Interchange
MW #13
Roadside Park
MW #11
MW #12
Domestic Water Well
33
35
T32N
T31N
MW #9
North Waste Rock Dump Expansion Area
North Waste Rock Dump
MW #8
PW #2
MW #7
PW #7
MW #16
PW #6
PW #1
Heap Leach Pad
PW #3
MW #17
Humboldt City
R33E
Southern Pacific Railroad
MW #15
Pit
MW #14
MW #23A,B
PW #4
MW #23C
South Heap Leach Pad
Interstate 80
South Waste Rock Dump
South Waste Rock Dump Expansion Area
Proposed Permit Boundary
4200
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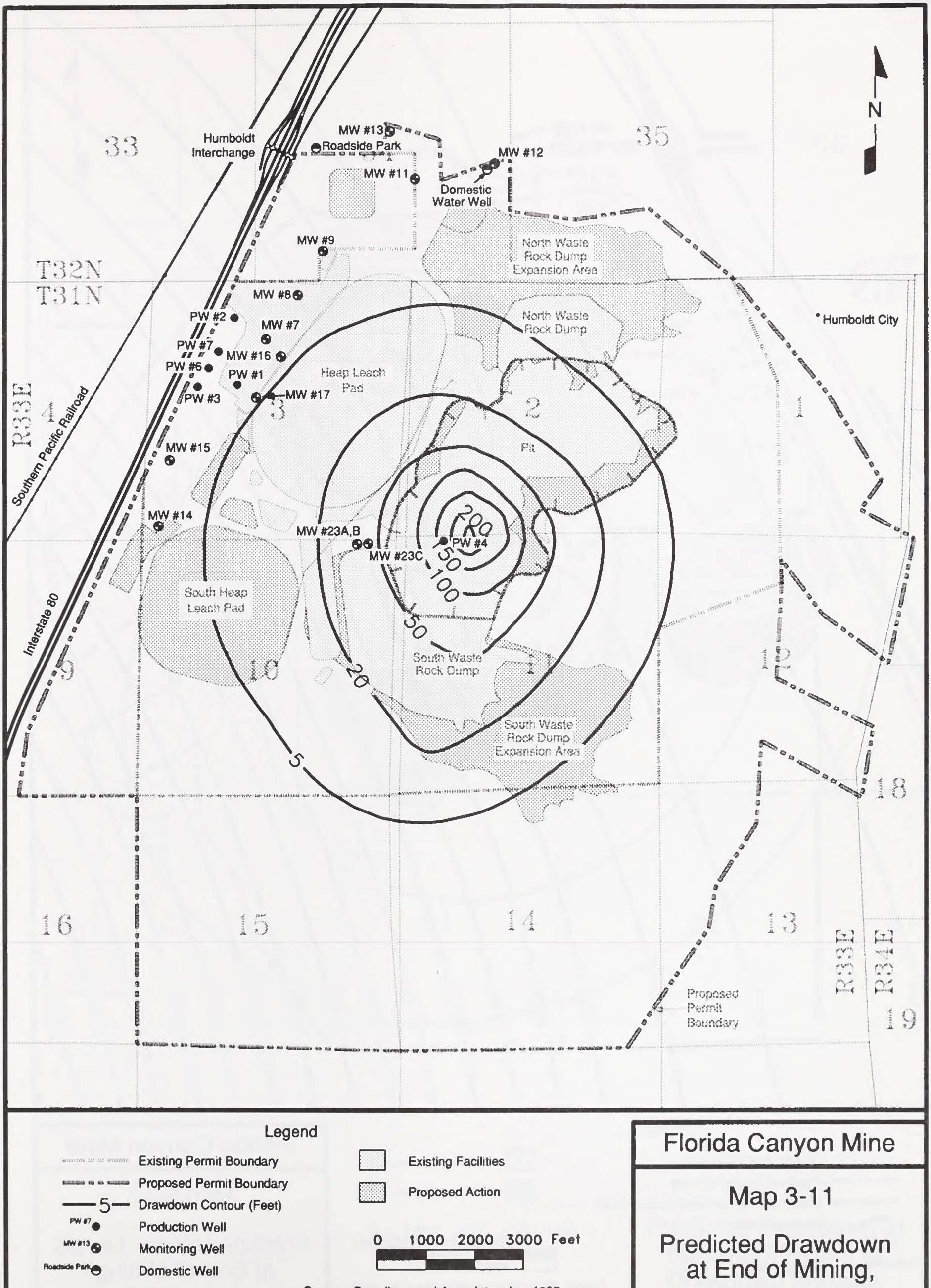
5600
5700
5800
R33E
R34E
N
Legend
Existing Permit Boundary
Proposed Permit Boundary
Steady State Water Level Surface (Feet)
Production Well
Monitoring Well
Domestic Well
Existing Facilities
Proposed Action
0 1000 2000 3000 Feet
Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 3-10
Simulated Steady State Water Levels Prior to Mine Dewatering

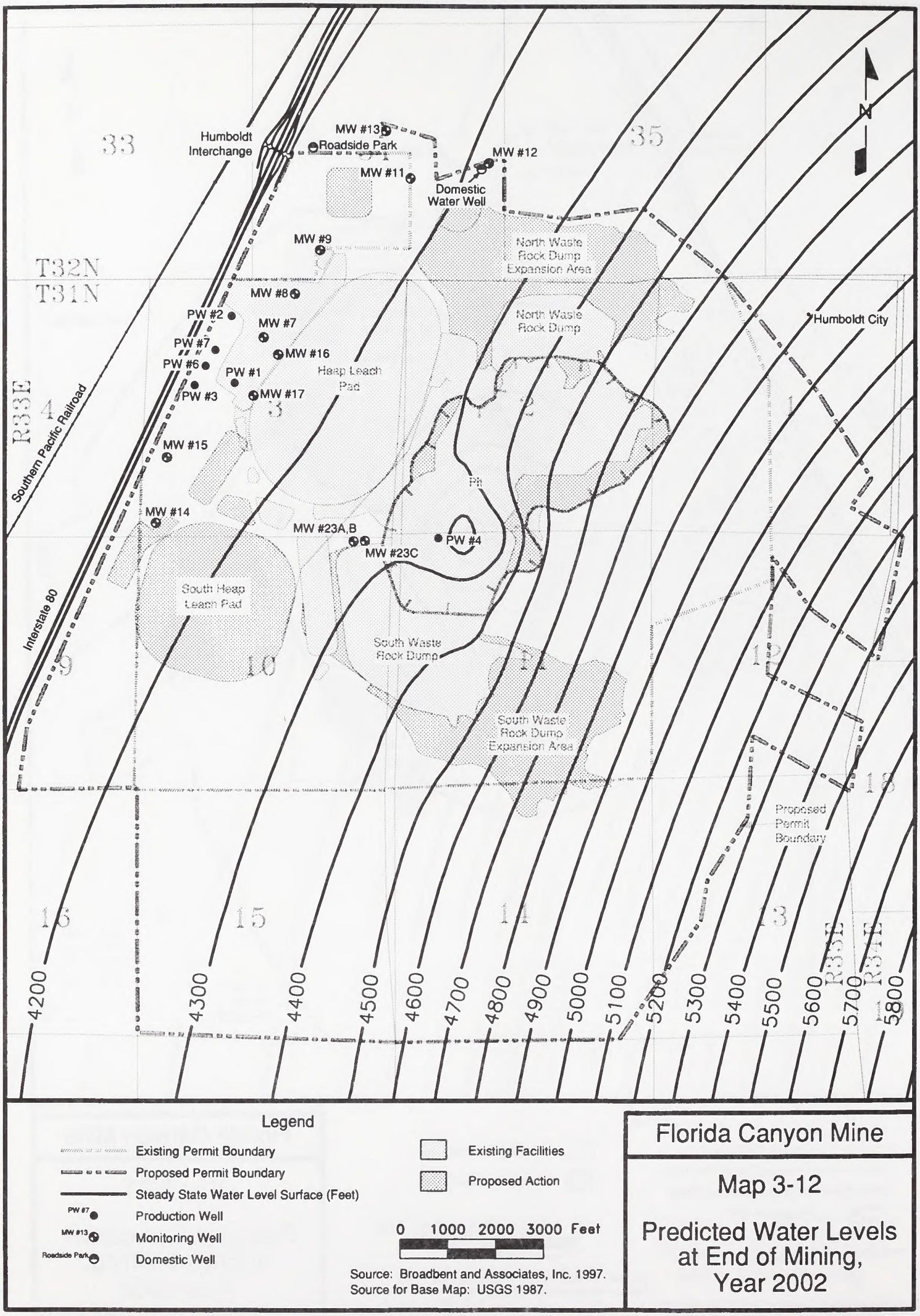


Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 3-11

Predicted Drawdown at End of Mining, Year 2002



Humboldt Interchange
MW #13
Roadside Park
MW #12
MW #11
Domestic Water Well
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T32N
T31N
MW #9
North Waste Rock Dump Expansion Area
MW #8
PW #2
MW #7
North Waste Rock Dump
Humboldt City
PW #7
MW #16
PW #6
PW #1
Heap Leach Pad
PW #3
MW #17
R33E
Southern Pacific Railroad
4
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2
1
MW #15
Pit
MW #14
MW #23A,B
PW #4
MW #23C
South Heap Leach Pad
Interstate 80
South Waste Rock Dump
9
10
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South Waste Rock Dump Expansion Area
18
Proposed Permit Boundary
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5800
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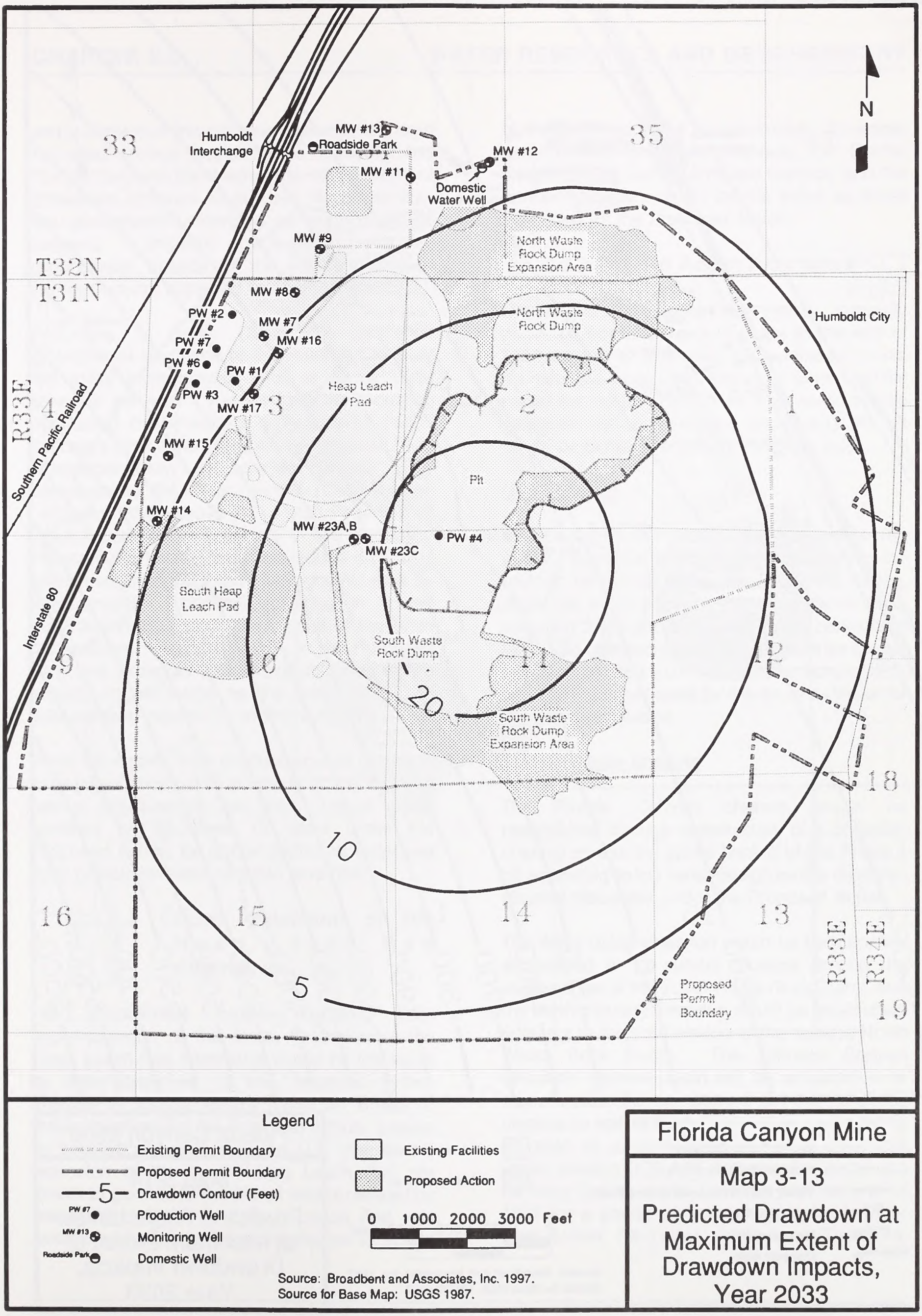
Legend
Existing Permit Boundary
Proposed Permit Boundary
Steady State Water Level Surface (Feet)
Production Well
Monitoring Well
Domestic Well
Existing Facilities
Proposed Action
0 1000 2000 3000 Feet
Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 3-12
Predicted Water Levels at End of Mining, Year 2002


N
Humboldt Interchange
MW #13
Roadside Park
MW #11
MW #12
Domestic Water Well
MW #9
North Waste Rock Dump Expansion Area
North Waste Rock Dump
Humboldt City
MW #8
PW #2
MW #7
MW #16
PW #7
PW #6
PW #1
PW #3
MW #17
Heap Leach Pad
Pit
MW #15
MW #14
MW #23A,B
MW #23C
PW #4
South Heap Leach Pad
South Waste Rock Dump
South Waste Rock Dump Expansion Area
Southern Pacific Railroad
Interstate 80
T32N
T31N
R33E
R34E
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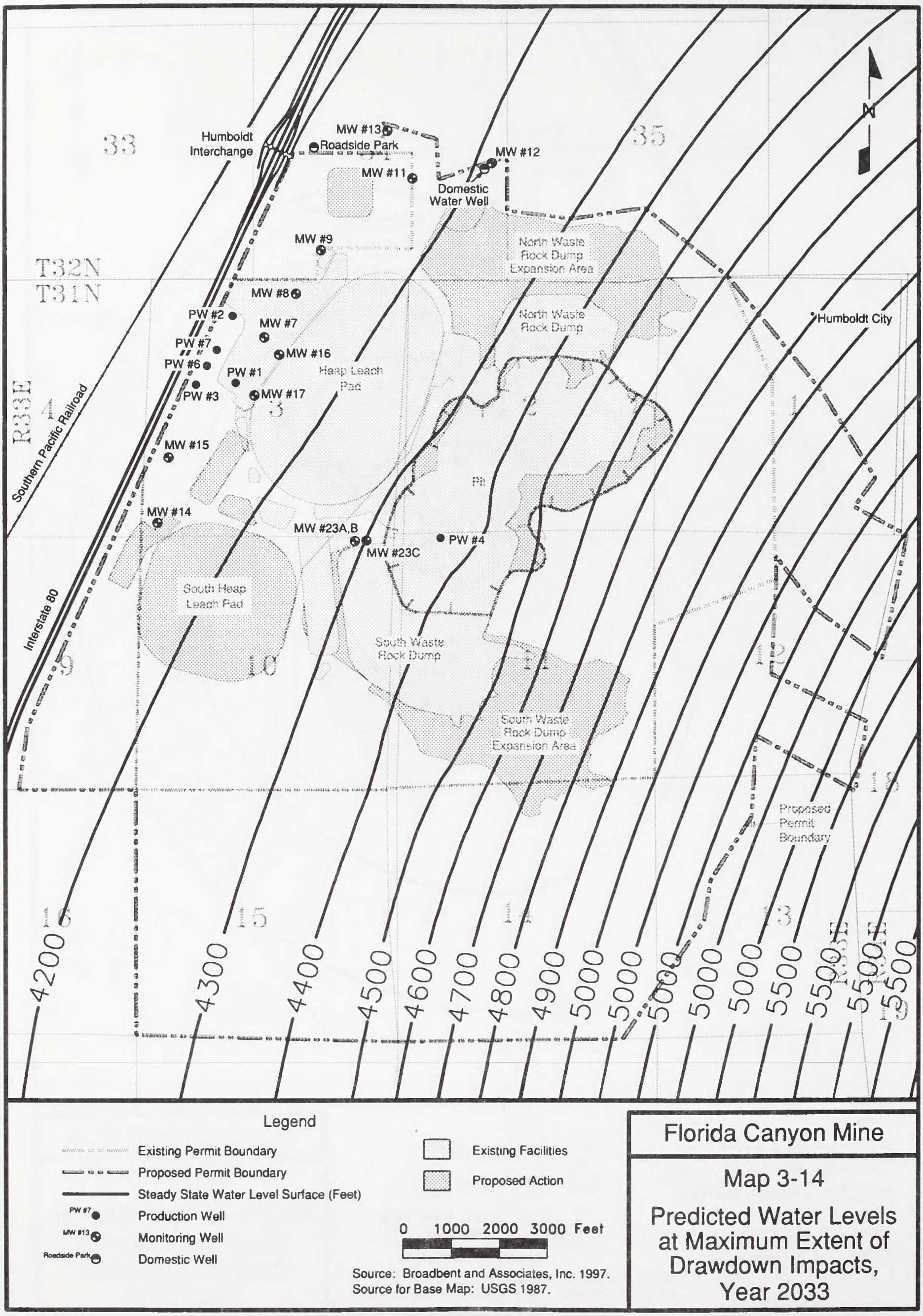
Proposed Permit Boundary
Legend
Existing Permit Boundary
Proposed Permit Boundary
Drawdown Contour (Feet)
Production Well
Monitoring Well
Domestic Well
Existing Facilities
Proposed Action
0 1000 2000 3000 Feet
Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 3-13
Predicted Drawdown at Maximum Extent of Drawdown Impacts, Year 2033


Humboldt Interchange
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Roadside Park
MW #12
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Domestic Water Well
MW #9
North Waste Rock Dump Expansion Area
North Waste Rock Dump
T32N
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MW #8
PW #2
MW #7
PW #7
MW #16
PW #6
PW #1
Heap Leach Pad
PW #3
MW #17
R33E
Southern Pacific Railroad
Humboldt City
MW #15
Pit
MW #14
MW #23A,B
PW #4
MW #23C
South Heap Leach Pad
South Waste Rock Dump
South Waste Rock Dump Expansion Area
Interstate 80
Proposed Permit Boundary
4200
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4800
4900
5000
5000
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5000
5000
5500
5500
5500
5500
Legend
Existing Permit Boundary
Proposed Permit Boundary
Steady State Water Level Surface (Feet)
Production Well
Monitoring Well
Domestic Well
Existing Facilities
Proposed Action
0 1000 2000 3000 Feet
Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 3-14
Predicted Water Levels at Maximum Extent of Drawdown Impacts, Year 2033

and is outside of this contour. Drawdown should not affect springs located in the Humboldt and Florida Canyons; the steady state water levels and drawdown contours lie at lower elevations than the groundwater emerging as springs in the canyons. Impacts to surface water or groundwater outside of the 5-foot drawdown contour are not expected to be noticeable.

According to Eakin (1962) the estimated groundwater discharge to the Humboldt River in the Imlay Hydrographic Area is about 1,000 acre-feet per year. Results from the modeling conducted by Broadbent & Associates (1997) indicate a similar discharge to the Humboldt River of approximately 1,825 acre-feet per year. This compares to the mean annual runoff for the Humboldt River above Rye Patch Reservoir of 235,000 acre-feet per year. The modeling indicates that mining activities reduce discharge to the river from the Imlay Hydrographic Area by approximately 2 percent, resulting in a net reduction in Humboldt River runoff of less than 0.02 percent. Impacts to flow in the Humboldt River are expected to be negligible due to the impact on discharge to the river (less than 0.02 percent) caused by mining activities.

Water withdrawal from production wells for use in mine operations would continue at the reduced rate of 505 acre-feet per year. Usage would continue an additional 10 years under the Proposed Action, for a total additional water use from production wells of 5,050 acre-feet.

3.3.2.2 North Extension of the Heap Leach Pad Alternative

The groundwater impacts resulting from implementation of the North Extension of the Heap Leach Pad Alternative would be the same as those described for the Proposed Action. Impacts to surface waters would be similar to those described for the Proposed Action. Losses to jurisdictional waters of the U.S. due to the extension of the North Heap Leach Pad are similar to gains to jurisdictional waters realized by not building the South Heap Leach Pad and associated facilities. Total disturbance to waters of the U.S. would be approximately 3.0 acres. Other water diversion channels for Florida Canyon, Wiley Gulch, Johnson Canyon, and the northern tributary would be the same as those described for the Proposed Action.

3.3.2.3 No Action Alternative

Under the No Action Alternative, currently permitted operations would cease at the end of 1997 and further expansion of the mine pit, waste rock dumps, heap leach pad, and other facilities would not occur. The Phase 4 pit would not be extended below its current depth and the pit would be partially backfilled (see Map 2-6).

<u>Geochemisty</u>

As reported by SMI (1997) the waste rock for the existing operation is similar geochemically to the rock to be mined under the Proposed Action. Since the waste rock for the entire life of mine, including the Proposed Action, is not considered to be acid generating, then the impacts for the No Action Alternative from the geochemistry of rock types at the mine would be the same as those for the Proposed Action.

<u>Surface Water Impacts</u>

The Florida Canyon channel would be established through construction of a diversion channel across the partial backfill of the Phase 4 pit according to the same design as the diversion channel discussed under the Proposed Action.

The Wiley Gulch diversion would be permanently established in its current location around the southern toe of the South Waste Rock Dump, and the north tributary diversion would be established adjacent to the northern toe of the existing North Waste Rock Dump. The Johnson Canyon Diversion channel would not be constructed as there would be no impact to this channel. Impacts to waters of the U.S. would be limited to an area of approximately 4.1 acres permitted under existing COE NW #26 permit. Water use for heap rinsing would continue past the end of 1997 for a period of 4 years using fresh water from Lower Pitt-Taylor Reservoir. Therefore,

additional surface water diversions from the Humboldt River would not occur. Surface water impacts from the No Action Alternative would be less than those for the Proposed Action.

__Groundwater Impacts__

Dewatering under the No Action Alternative would continue at the current rate of about 70 gpm until termination of currently permitted mining activities. Drawdowns and water levels for the No Action Alternative were estimated by Broadbent & Associates (1997) using the MODFLOW groundwater model. Map 3-15 shows the drawdowns for the No Action Alternative (existing condition) and Map 3-16 shows the water levels for the existing condition. The drawdown in the vicinity of the Phase 4 pit would be about 180 feet less than for the Proposed Action. The extent of drawdown impacts, the time for a 90 percent recovery of the groundwater levels in the pit vicinity, and the depletion of groundwater flow to the Humboldt River would be less than for the Proposed Action. Partial backfill of the pit would eliminate the potential for development of a permanent pit lake. Therefore, groundwater impacts from the No Action Alternative would be less than for the Proposed Action.

3.3.3 Cumulative Impacts

Mining activity affects water quality by allowing water to come into contact with geologic materials that have been altered by mining processes, or by exposing geologic materials to oxygen which may increase oxidation rates (if not previously oxidized). Water moving through this disturbed/altered material can then dissolve and/or carry contamination to surface and groundwater resources. Mining activity affects water quantity by removing water from sources (i.e., aquifers, streams, lakes etc.) for processing, dust suppression, and other mining related activities. The cumulative affects area for water quality and quantity is the same as the cumulative affects area for geology and minerals (see Map 3-5). No other major mining or other projects are anticipated in the reasonably foreseeable future within the cumulative affects area.

Groundwater modeling of the predicted drawdown associated with dewatering the mine pit indicates that the cone of depression will continue to expand for 31 years after mining operations cease. The maximum extent of the 5-foot drawdown contour is within the southern Expansion Project boundary, and remains within the current project boundary to the west and north of the pit.

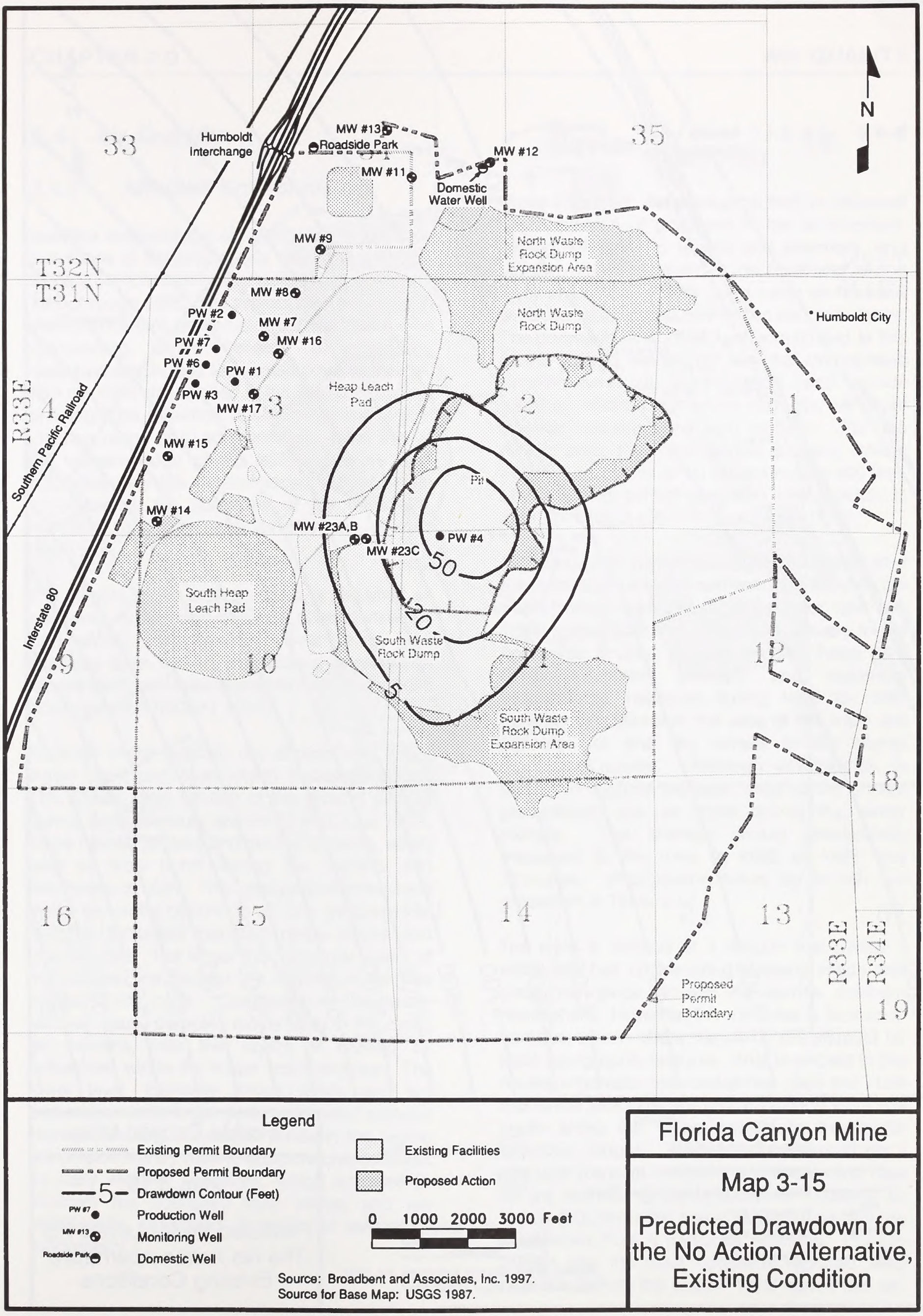
Due to the minimal withdrawal of water, the composition of the overburden and waste rock, and the proposed diversions, reclamation plans, and closure plans, cumulative impacts to groundwater are expected to be minimal. Observable impacts to the Humboldt River are not anticipated. However, groundwater modeling suggests a maximum decline in groundwater recharge to the river of 36.5 acre-feet/year (about 0.02 percent of annual runoff) and an average decline in recharge of 17 acre-feet/year over the 120-year recovery period. Since there are no perennial streams in the project area, there would be no cumulative impacts to surface water quality or quantity. Past, present, and reasonably foreseeable future actions, and the Proposed Action would result in the re-establishment of ephemeral drainages classified as other waters of the United States.

3.3.4 Mitigation and Monitoring

No mitigation and monitoring above that discussed in Section 2.2.14., Environmental Protection Measures, is proposed for water resources.

3.3.5 Residual Adverse Impacts

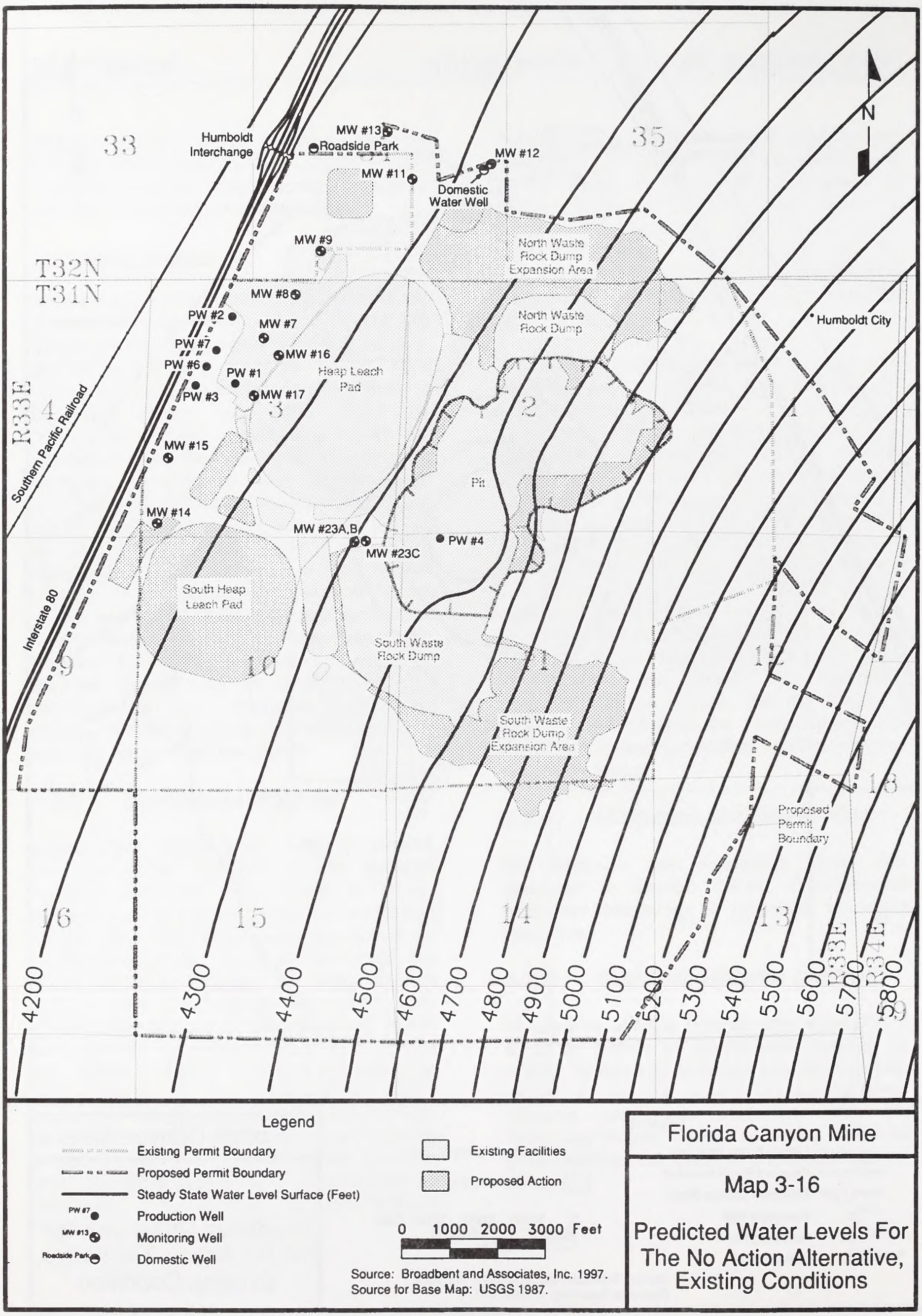
No adverse residual impacts area expected to occur to surface or groundwater quantity or quality. Ephemeral drainages classified as other waters of the U.S. would be re-established following disturbance associated with the Expansion Project. Partial backfilling of the pit would eliminate the development of a permanent pit lake.



Florida Canyon Mine

Map 3-15

Predicted Drawdown for the No Action Alternative, Existing Condition


33
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Humboldt Interchange
MW #13
Roadside Park
MW #11
MW #12
Domestic Water Well
MW #9
North Waste Rock Dump Expansion Area
T32N
T31N
MW #8
PW #2
MW #7
North Waste Rock Dump
Humboldt City
PW #7
MW #16
PW #6
PW #1
Heap Leach Pad
PW #3
MW #17
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Southern Pacific Railroad
MW #15
Pit
MW #14
MW #23A,B
PW #4
MW #23C
South Heap Leach Pad
Interstate 80
South Waste Rock Dump
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South Waste Rock Dump Expansion Area
Proposed Permit Boundary
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R34E
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Legend
Existing Permit Boundary
Proposed Permit Boundary
Steady State Water Level Surface (Feet)
PW #7
Production Well
MW #13
Monitoring Well
Roadside Park
Domestic Well
Existing Facilities
Proposed Action
0 1000 2000 3000 Feet
Source: Broadbent and Associates, Inc. 1997.
Source for Base Map: USGS 1987.
Florida Canyon Mine
Map 3-16
Predicted Water Levels For The No Action Alternative, Existing Conditions

3.4 Air Quality

3.4.1 Affected Environment

Baseline meteorology, air quality, and dispersion conditions at the project site were characterized by data collected at the Florida Canyon Mine from 1995 through 1996. The project area is located in the northwestern portion of the Great Basin. The surrounding terrain consists of alternating mountain ranges and sagebrush-covered valleys, with the mine site situated in the Basin and Range physiographic province. Elevations at the project location range from approximately 4,200 feet at the western edge of the facility to more than 6,200 feet near the eastern edge. Higher terrain is located to the southeast of the mine site, including Star Peak with an elevation of over 9,800 feet.

The climate in the project region is classified as semi-arid. A semi-arid climate is characterized by low rainfall, low humidity, clear skies, and relatively large annual and diurnal temperature ranges (National Oceanographic and Atmospheric Administration [NOAA] 1974).

Because of the typically dry atmosphere, bright sunny days and clear nights frequently occur. This allows rapid heating of the ground surface during daylight hours and rapid cooling at night. Since heated air rises and cooled air sinks, winds tend to blow uphill during the daytime and downslope at night. This upslope and downslope cycle generally occurs in all the geographical features, including mountain range slopes and river courses. The larger the horizontal extent of the feature, the greater the volume of air that moves in the cycle. Complexity of the terrain features cause complex movements in the cyclic air patterns, with thin layers of moving air embedded within the larger scale motions. The lower level, thermally driven winds also are embedded within larger scale upper wind systems (synoptic winds). Synoptic winds in the region are predominantly west to east; are characterized by daily weather variations, which enhance or diminish the boundary layer winds; and are significantly channeled by regional and local topography.

3.4.1.1 Climatology and Meteorology

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, wind (speed and direction), and stability. Mixing height is the thickness of the layer of air within which rising warm air from the surface would mix by convection and turbulence. The degree to which pollutants are diluted in this mixed layer is determined by local atmospheric conditions, terrain configuration, and source location. Mixing heights vary diurnally, with local weather systems, and with season. For the project area, the mean annual morning mixing height is estimated to be approximately 900 feet, and the mean annual afternoon mixing height is approximately 7,900 feet (Holzworth 1972).

Meteorological parameters were monitored at a tower located near the northern boundary of the waste dump. Average temperatures for 1995 and 1996 ranged from the 30s (°F) in January to the upper 70s in July. Figure 3-6 and Table 3-12 depict minimum, average, and maximum temperatures measured during 1995 to 1996. Summer conditions in the area of the mine are typically hot and dry except in the higher mountains ranges. Although precipitation is spread throughout the year, most of the annual precipitation falls as snow during the winter months. The average annual precipitation measured at the mine in 1995 to 1996 was 14 inches. Precipitation totals by month are presented in Table 3-13.

The mine is located at a latitude that places it within the belt of prevailing westerly winds that circle the globe around the earth's northern hemisphere. However, the mine site is located in complex terrain where the winds are affected by local topographic features. This is evident in the on-site wind data collected during 1995 and 1996 that show predominant winds blowing from the south along the valley parallel to the major mountain ranges. Winds were measured on a 10-meter tower at the mine; an annual wind rose for the monitoring site is shown in Appendix B. These data show the percentage of time that the wind blows from a particular direction. For the project site, the most frequently reported wind direction is from the south. Wind speed has an

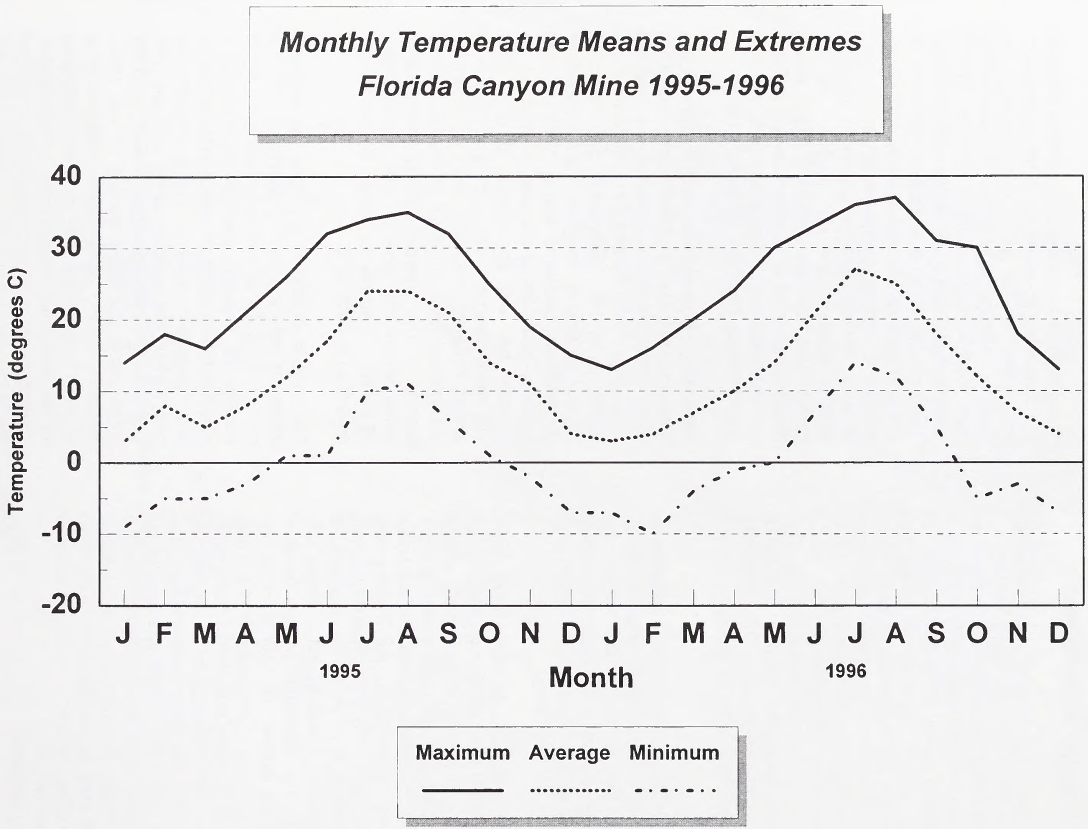


Figure 3-6. Temperature Average and Extremes - Florida Canyon Mine

Table 3-12

Minimum, Maximum, and Average Temperatures (°F)
Florida Canyon Mine 1995 and 1996

Month	Minimum[1]	Maximum[1]	Average[1]
January	17.6	56.3	37.4
February	18.5	62.6	42.8
March	23.9	64.4	42.8
April	28.4	72.5	48.2
May	32.9	82.4	55.4
June	39.2	90.5	66.2
July	53.6	95.0	77.9
August	52.7	96.8	76.1
September	41.9	88.7	67.1
October	28.4	81.5	55.4
November	27.5	65.3	48.2
December	19.4	57.2	39.2
Annual	32.0	76.1	54.7

[1]Temperatures are averaged for 1995-1996.

Table 3-13

Monthly Precipitation
Florida Canyon Mine 1995 and 1996

Month	Precipitation (inches)[1]
January	1.86
February	1.13
March	1.84
April	1.41
May	2.28
June	1.71
July	0.10
August	0.07
September	0.02
October	0.35
November	0.77
December	2.39
Annual Average	13.90

[1]Precipitation is averaged for 1995-1996.

important effect on area ventilation and the dilution of pollutant concentrations from individual sources. Light winds, in conjunction with large source emissions, may lead to an accumulation of pollutants that can stagnate or move slowly to downwind areas. During stable conditions, downwind usually means down valley or toward lower elevations.

Morning atmospheric conditions tend to be stable because of the rapid cooling of the layers of air nearest the ground. Afternoon conditions, especially during the warmer months, tend to be neutral to unstable because of the rapid heating of the surface under clear skies. During the winter, periods of stable afternoon conditions may persist for several days in the absence of synoptic scale storm systems to generate higher winds with more turbulence and mixing. A high frequency of inversions at lower elevations during the winter can be attributed to the nighttime cooling and sinking air flowing from higher elevations to the low lying areas in the basins. Although winter inversions are generally quite shallow, they tend to be more stable because of reduced surface heating.

3.4.1.2 Air Quality

Air quality is defined by the concentration of various pollutants and their interactions in the atmosphere. Pollution effects on receptors have been used to establish a definition of air quality. Measurement of pollutants in the atmosphere is expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Both long-term climatic factors and short-term weather fluctuations are considered part of the air quality resource because they control dispersion and affect concentrations. Physical effects of air quality depend on the characteristics of the receptors and the type, amount, and duration of exposure. Air quality standards specify acceptable upper limits of pollutant concentrations and duration of exposure. Air pollutant concentrations within the standards are generally not considered to be detrimental to public health and welfare.

The relative importance of pollutant concentrations can be determined by comparison with an appropriate national and/or state ambient air quality standard. National and state ambient air quality standards are presented in Table 3-14. These are the standards applicable to Hydrographic Basin 72 (Imlay Area) that encompasses the project area. An area is designated by the USEPA as being in attainment for a pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards (NAAQS). An area is not in attainment if violations of NAAQS for that pollutant occur. Areas where insufficient data are available to make an attainment status designation are listed as unclassifiable and are treated as being in attainment for regulatory purposes.

The existing air quality of the project area is typical of the largely undeveloped regions of the western United States. For the purposes of statewide regulatory planning, this area has been designated as in attainment for all pollutants that have an ambient air quality standard. Table 3-15 summarizes particulate matter concentrations collected during 1994 and 1995 at the mine. The maximum 24-hour value reported during this period was 119 $\mu g/m^3$, which is less than the Nevada state and Federal 24-hour particulate standards of 150 $\mu g/m^3$. The maximum average annual value reported was 35 $\mu g/m^3$, which is less than the Nevada and Federal annual arithmetic mean particulate matter standard of 50 $\mu g/m^3$.

3.4.2 Environmental Consequences

3.4.2.1 Proposed Action

No long-term impacts to air quality resources would be expected from the Proposed Action; however, short-term impacts would be expected to occur. Mining, ore-processing, and construction activities associated with the proposed project would continue to be a source of both total suspended particulates and PM_{10}. Fuel-burning mobile sources and a propane-fired boiler would be sources of low levels of gaseous pollutants such as sulfur dioxide (SO_2), oxides of nitrogen (NO_2), carbon monoxide (CO), and volatile organic compounds. A mercury retort would emit low levels of particulate and mercury. Except for increases caused by new construction, these are continuations of existing impacts.

Table 3-14

National and State Ambient Air Quality Standards

Pollutant	Averaging Time	Nevada Standards[1] Concentration[3]	National Standards[2,3] Primary[4]	National Standards[2,3] Secondary[5]
Sulfur Dioxide	Annual Arithmetic Mean	80 $\mu g/m^3$ (0.03 ppm)	80 $\mu g/m^3$ (0.03 ppm)	---
	24 hours	365 $\mu g/m^3$ (0.14 ppm)	365 $\mu g/m^3$ (0.14 ppm)	---
	3 hours	1,300 $\mu g/m^3$ (0.5 ppm)	---	1,300 $\mu g/m^3$ (0.5 ppm)
PM_{10}[6]	Annual Arithmetic Mean	50 $\mu g/m^3$	50 $\mu g/m^3$	50 $\mu g/m^3$
	24 hour	150 $\mu g/^m$	150 $\mu g/m^3$	150 $\mu g/m^3$
Ozone[7]	1 hour	235 $\mu g/m^3$ (0.12 ppm)	235 $\mu g/m^3$ (0.12 ppm)	Same as Primary Standards
Carbon Monoxide (below 5,000 feet MSL)	8 hours	10,000 $\mu g/m^3$ (9.0 ppm)	10,000 $\mu g/m^3$ (9 ppm)	Same as Primary Standards
Carbon Monoxide (at or above 5,000 feet MSL)	8 hours	6,670 $\mu g/m^3$ (6.0 ppm)	---	---
Carbon Monoxide (at any elevation)	1 hour	40,000 $\mu g/m^3$ (35 ppm)	40,000 $\mu g/m^3$ (35 ppm)	Same as Primary Standards
Nitrogen Dioxide	Annual Arithmetic Mean	100 $\mu g/m^3$ (0.05 ppm)	100 $\mu g/m^3$ (0.05 ppm)	Same as Primary Standards
Crystalline Silica	8 hours	2.38 $\mu g/m^3$	---	---

[1]Nevada standards are values that are not to be exceeded where the general public has access.

[2]National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.

[3]Concentration expressed first in units in which it was promulgated $\mu g/m^3$, and are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.

Table 3-14 (Continued)

[5]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after implementation plan is approved by the USEPA.

[6]The Nevada State Implementation Plan adopted the Federal PM_{10} Standard as of December 1991.

[7]The state ozone standard for Hydrographic Basin 90 (Lake Tahoe) is 195 $\mu g/m^3$ (0.10 ppm).

Table 3-15

Summary of Particulate Matter Measurements at the Florida Canyon Mine Project Site $\mu g/m^3$ 1994 through 1995

Sampler	24-Hour Maximum	24-Hour 2nd Maximum	Annual Average	Number of Samples
North	119	108	35	120
South	100	99	23	119

The air quality impact of a fugitive dust source depends on the quantity and drift potential of the dust particles released into the atmosphere. The larger dust particles settle out near the source, while fine particles are dispersed over much greater distances. Theoretical drift distances, as a function of particulate diameter and mean wind speed, have been computed for fugitive dust emissions. For a typical wind speed of 10 miles per hour (mph), particles larger than 100 micrometers (μm) are likely to settle out within 20 to 30 feet from the source. (For comparison, a human hair has a thickness of about 100 μm.) Particles 30 to 100 μm, depending on the extent of atmospheric turbulence, are likely to settle within a few hundred feet. Dust particles smaller than 30 μm are generally recognized as emissions that may remain suspended indefinitely.

Air quality in the area of the mine would be affected by both construction and operation of mining facilities. Reclamation activities associated with the eventual closing of the Florida Canyon Mine would cause an increase in fugitive and gaseous emissions in the local area during the reclamation phase. Air quality effects from construction would result in temporary impacts due to increases in local fugitive dust levels. Dust generated from these open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream (e.g., stack, chimney, or vent). The principal sources of fugitive dust would be related to construction activities, including: land clearing, earth moving, scraping, hauling, and materials storage and handling; drilling and blasting; truck loading operations; wind erosion from stockpiles; and ore handling operations. In addition, other fugitive emissions impacts would be caused by mud/dirt carry-out onto paved surfaces. The additional surface loading would cause an increase in fugitive emissions during the lifetime of the construction project.

During construction, operation, and reclamation, vehicle exhaust emissions would be generated, but such emissions are small compared to fugitive emissions from earth moving, hauling, and other construction activities and would not affect regional air quality. Particulate levels from construction, operation, and reclamation activities would vary, and impacts would depend on the activity location and the daily wind and weather. These activities would require a surface disturbance permit from the NDEP, which would require that watering or other measures be taken to limit fugitive dust emissions. While measures such as watering would reduce the amount of emissions from such activities, some level of fugitive dust emissions would be unavoidable due to the nature of the work. Although some impacts on air quality would inevitably occur during construction, operation, and reclamation, they would be transitory and temporary, limited in duration, and would end at the completion of that particular phase of the work. Once reclamation was completed, pollutant concentrations would return to background levels.

Air quality impacts due to emissions from mining operations would occur throughout the operational phase of the project. The primary pollutant would be fugitive dust particulates (total suspended particulates and PM_{10}) generated by the crushers, screens, conveyors, and other processes. All criteria pollutant emission rates would be less than 250 tons per year, therefore the proposed project would not be a "major stationary source" as defined by the USEPA. Air pollutant sources are deemed "major" for Prevention of Significant Deterioration (PSD) purposes if their emissions exceed 250 tons per year.

Sources of fugitive dust and other pollutants include:

- Crushers
- Conveyors and stackers
- Screens
- Blasting
- Lime or cement silo loading and unloading
- Dore furnace
- Truck loading and dumping
- Overburden and ore stockpiles
- Paved and unpaved roads

Fugitive dust emissions may be generated by wind erosion of open aggregate storage piles and exposed areas within an industrial facility. These sources typically are characterized by nonhomogeneous surfaces impregnated with nonerodible elements (particles larger than

approximately 1 centimeter in diameter). Field testing of aggregate piles and other exposed materials using a portable wind tunnel has shown that: a) threshold wind speeds exceed 5 meters per second (11 mph) at 15 centimeters above the surface or 10 meters per second (22 mph) at 7 meters above the surface, and b) particulate emission rates tend to decay rapidly (half-life of a few minutes) during an erosion event (USEPA 1995). In other words, these aggregate material surfaces are characterized by finite availability of erodible material (mass/area) referred to as the erosion potential. Any natural crusting of the surface binds the erodible material, thereby reducing the erosion potential.

Emissions generated by wind erosion also are dependent on the frequency of disturbance of the erodible surface because each time that a surface is disturbed, its erosion potential is restored. A disturbance is defined as an action that results in the exposure of fresh surface material. On a storage pile, this would occur whenever aggregate material is either added to or removed from the old surface. A disturbance of an exposed area also may result from the turning of surface material to a depth exceeding the size of the largest pieces of material present.

The emission factor for wind-generated particulate emissions from mixtures of erodible and nonerodible surface material subject to disturbance may be expressed in units of tons per acre per year or other appropriate units.

In calculating emission factors, each area of an erodible surface that is subject to a different frequency of disturbance is treated separately. For a surface disturbed daily, N = 365 per year, and for a surface disturbance once every 6 months, N = 2 per year.

Emissions of PM_{10} from each potential source at the mine were calculated for input into the ISC3 dispersion model. The dispersion model was used to predict 24-hour and annual PM_{10} impacts. Emissions from many of the sources were either wind speed dependant or were released into the atmosphere at the temperature of the ambient air. For these sources, an input file was constructed that calculated emissions based on hourly wind speed and calculated release parameters based on ambient temperature. Total emissions of PM_{10} from the mine were calculated to be 95.9 tons per year.

Results from a dispersion modeling analysis of the Proposed Action show that maximum concentrations of PM_{10} would not exceed Nevada Standards or NAAQS (Table 3-10). The maximum predicted 24-hour PM_{10} concentration was 16.5 $\mu g/m^3$. Total predicted 24-hour impact, which includes the Nevada Division of Environmental Protection 24-hour background level of 10.2 $\mu g/m^3$, is 26.7 $\mu g/m^3$. The predicted maximum annual concentration was 5.9 $\mu g/m^3$. Adding the NDEP annual background of 10.2 $\mu g/m^3$ yields a total predicted annual impact of 16.1 $\mu g/m^3$. The maximum 24-hour and annual impacts were predicted to occur to the east of the South Crushing System, near the eastern property boundary. Due to the very low emission levels of NO_2, CO, and SO_2, the impacts from these pollutants also would not exceed Nevada Standards or NAAQS. The proposed project would comply with all existing air quality standards in Nevada.

3.4.2.2 North Extension of the Heap Leach Pad Alternative

The maximum PM_{10} impacts for the Proposed Action were predicted to occur near the eastern property boundary, to the east of the crusher facility. These impacts were well below Federal and state air quality standards. Emissions from the extension of the leach pad toward the north would differ from the Proposed Action in that additional ore transfer points would be located in the path toward the extended pad. Emissions from these additional transfers would be much smaller than the sources that contributed to the maximum impacts for the Proposed Action. Therefore, impacts from the North Extension of the Heap Leach Pad Alternative also would be expected to be well below Federal and state standards for PM_{10}.

3.4.2.3 No Action Alternative

Under the No Action Alternative, air emission levels would continue at the current levels through 1997. Fugitive emission levels would gradually decrease through the reclamation period.

3.4.3 Cumulative Impacts

Cumulative impacts to air quality include impacts from the Florida Canyon Mine emission sources including mining operations and fugitive dust, impacts from nearby existing/proposed industrial or mining operations, and impacts from background emission sources (e.g., natural background from windblown dust and public traffic on unpaved roads in the region).

As stated previously, air impacts from mining operations tend to be localized in the vicinity of the source. The geographic extent of impacts is therefore small. For the Florida Canyon Mine, the maximum extent of annual PM_{10} impacts greater than 1 $\mu g/m^3$ and 24-hour impacts greater than 5 $\mu g/m^3$ is approximately 1 kilometer or less from the mine boundary (Map 2-2). Even nearby operations would have only limited overlap with impacts from the Florida Canyon Mine. Since the Florida Canyon Mine site is the largest air emission source in the immediate vicinity, its impacts dominate any cumulative impacts to air quality.

Cumulative impacts from existing operations are already reflected in the measured particulate levels at the site. As shown in Table 3-15, measured concentrations near the project site are well within the ambient standards, indicating minimal contributions from other sources in the local region. Modeling results confirm that when impacts from the existing mine operations and from other mines in the area are added to the new impacts from the Proposed Action, the resultant cumulative impacts are well below state and Federal ambient air quality standards.

3.4.4 Potential Mitigation and Monitoring

Air quality permits issued by the NDEP would require that the Florida Canyon Mine control emissions, including fugitive emissions, from sources at the mine site due to mining activities. FCMI would apply all air pollution controls specified in its air quality permit to reduce emissions during expansion and operation of the mine (NAC 445B.365). Therefore, additional mitigation measures are not recommended.

3.4.5 Residual Adverse Impacts

There would be no residual adverse impacts to air quality from the proposed project, since reclamation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, particulate levels should return to what is typical for a dry desert environment. Once the disturbance ceases and wind erodible surfaces are reclaimed, air resources would return to pre-mining conditions.

3.5 Soils

3.5.1 Affected Environment

The soil substrate within the project area primarily consists of basin alluvial deposits, which are several thousands of feet deep. The geologic formations associated with the Humboldt Range immediately east of the project area combined with lake sediments on the valley floors contribute to the soils formed in the basins. Rising from the basin alluvial fans are higher pediments, foothills, and uplands also included in the project area. Information regarding soils located in the project area and vicinity was primarily obtained from the Order III Soil Survey of Pershing County and the Florida Canyon Mine Order I Soil Survey Report (Soil Conservation Service 1994; Water Research Development 1995).

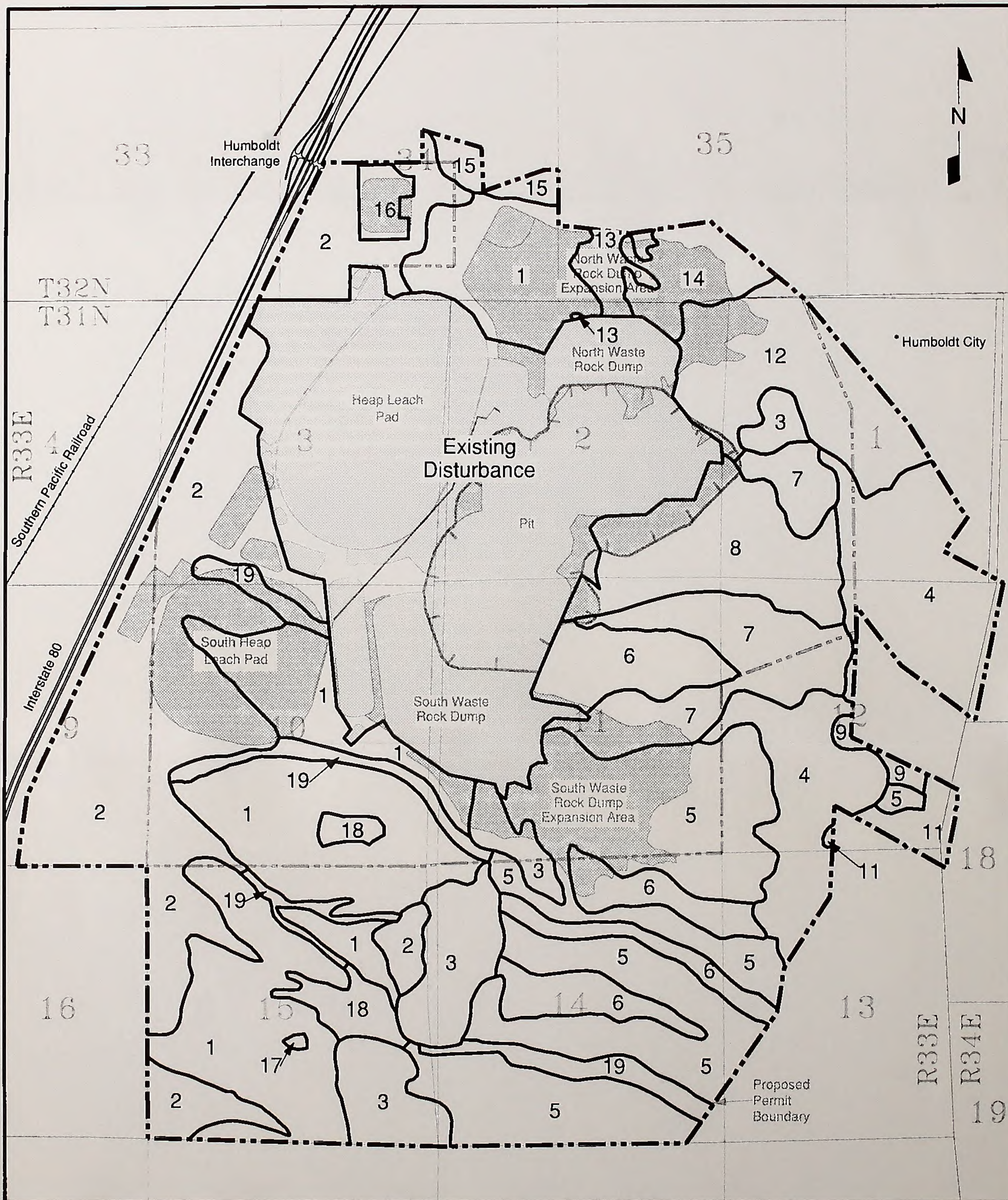
A total of 18 soil mapping units occur in the project vicinity (Water Research Development 1995). Three soil mapping units (9, 11, and 15) occur in the immediate vicinity of the project area. Eight soil series, which correspond to 11 soil mapping units, occur in the project area, as reported by Water Research Development (1995) (Map 3-17). A summary of the physical characteristics and suitability of these soils for reclamation is provided in Table 3-16.

The Atlow very gravelly loams occur on 30 to 50 percent slopes in the project area. Atlow soils consist of shallow, well drained, moderately slowly permeable soils found on south- and west-facing side slopes of mountains. Atlow soils formed from various parent materials including chert, argillite, shale, altered rhyolitic tuff, and andesite residuum. A typical soil profile includes a surface soil horizon of very gravelly loams, which are moderately alkaline to a depth of 6 inches. Below this horizon, the predominant soil is a very gravelly clay loam which also is moderately alkaline to 15 inches (depth of bedrock). Atlow soils have a high percentage of gravel, are shallow, and are severely erodable, making them unsuitable for reclamation purposes.

Wiskan very gravelly loams occur on 30 to 50 percent slopes in the project area. Wiskan soils consist of moderately deep, well drained, moderately slowly permeable soils that formed in residuum weathered from siliceous chert, argillite, and volcanic rocks. Wiskan soils are found on north- and east-facing side slopes of mountains. A typical profile contains surface soils that are very gravelly loam and are mildly alkaline to 9 inches. From 9 to 35 inches, the texture is very gravelly clay loam, which is mildly alkaline. Unweathered bedrock occurs at 35 inches. Wiskan soils can be salvaged for reclamation activities to a depth of 35 inches.

Misad gravelly very fine sandy loams are found on 2 to 8 percent slopes and are associated with fan skirts in the project area. The Misad soil series consists of very deep, well drained, moderately rapidly permeable soils that formed in alluvium derived from mixed rock sources. Soil textures include gravelly very fine sandy loam to 11 inches, which is strongly alkaline, and stratified fine sandy loam to very gravelly sandy loam to 28 inches, which is moderately alkaline and moderately saline. Below this horizon, soils are stratified with textures including very gravelly loamy sand to extremely gravelly coarse sand; this horizon extends to 60 inches and is moderately alkaline and moderately saline. Approximately 32 inches of Misad subsoils (from 28 to 60 inches deep) are suitable to be salvaged for reclamation activities. The surface soils are highly alkaline and are not suitable for reclamation.

Golconda very fine sandy loams occur on 2 to 8 percent slopes in the project area. Golconda soils formed on fan piedmont remnants in mixed alluvium derived from quartzite, rhyolite, chert, limestone, basalt, andesite, slate, shale, and tuff and in a mantle of volcanic loess. Textures include very fine sandy loam, which is moderately alkaline to a depth of 10 inches and gravelly clay loam, which is strongly alkaline, strongly saline, and moderatley sodic to a depth of 23 inches. A strongly cemented duripan occurs from 24 to 36 inches below the soil surface. The soil layer that occurs between 36 to 60 inches includes very gravelly loamy coarse sand, which is moderately alkaline and moderately saline. Golconda soils are probably suitable for reclamation activities to a depth of 23 inches.



Legend

- Existing Permit Boundary
- Proposed Permit Boundary
- Soil Map Unit Boundary
- Existing Facilities
- Proposed Action

0 1000 2000 3000 Feet

Note: See Table 3-12 for Description of Soil Map Unit Number

Source: WRD 1995.
Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 3-17

Soils in the Project Area

Table 3-16

Soil Map Unit Characteristics and Reclamation Suitabilities

Soil Series/Soil Mapping Unit Name	Associated Mapping Unit(s)	Associated Dominant Vegetation	Surface Texture	Reclamation Soil Salvage Depth (in.)	Limiting Factors [1]	Susceptibility to Erosion	Suitability for Revegetation
Atlow	4, 5, 7, 8, 12, 14	Black sagebrush, Sandberg bluegrass	Very gravelly loam	0	Coarse fragments: 0-45 percent cobbles and stones, 50-75 percent pebbles; bedrock: at 15 inches	Water - severe wind - slight	Unsuitable
Wiskan	6, 9[2]	Black sagebrush, bluebunch wheatgrass	Very gravelly loam	35	Coarse fragments: 0-25 percent cobbles and stones, 50-70 percent pebbles; bedrock: at 35 inches	Water - severe wind - slight	Suitable, with high coarse fragments.
Rock outcrop, rubble slopes	11[2]	NA	Rock	0	Bedrock	none	Unsuitable
Misad	2	Shadscale, bud sagebrush	Gravelly very fine sandy loam	32 (Depth: 28 to 60 inches)	Coarse fragments: 0-10 percent cobbles and stones, 30-80 percent pebbles, (increase with depth); alkalinity: 8.8 from 0-11 inches, 8.6 from 11-28 inches, <8.5 from 28-60 inches.	Water - slight wind - slight	Suitable, but with high coarse fragments, and strong alkalinity in surface soils.
Golconda	1	Shadscale, bud sagebrush	Very fine sandy loam	23	Alkalinity: 8.8 from 10-23 inches; duripan: from 23-36 inches; coarse fragments: 50-75 percent pebbles below duripan	Water - slight wind - slight	Probable, in drainages and deeper alluvium, test for alkalinity.

Table 3-16 (Continued)

Soil Series/Soil Mapping Unit Name	Associated Mapping Unit(s)	Associated Dominant Vegetation	Surface Texture	Reclamation Soil Salvage Depth (in.)	Limiting Factors [1]	Susceptibility to Erosion	Suitability for Revegetation
McConnel	1, 13	Wyoming big sagebrush, spiny hopsage, Sandberg bluegrass, bottlebrush squirreltail	Loam and gravelly fine sandy loam	> 60	Coarse fragments: 0-15 percent cobbles and stones, 65-90 percent pebbles: from 20-60 inches; Alkalinity: 8.5 from 20-60 inches	Water - slight wind - slight	Probable, in drainages.
Beoska	3	Shadscale, bud sagebrush, bottlebrush squirreltail	Very stony loam	0	Coarse fragments: 15-30 percent cobbles and stones, 10-25 percent pebbles from 0-13 inches; alkalinity: >8.7 below 13 inches	Water - slight wind - slight	Unsuitable
Oxcorel	15[2], 13, 1	Shadscale, bud sagebrush, bottlebrush squirreltail	Very stony loam	8	Coarse fragments: 10-25 percent cobbles and stones, 10-35 percent pebbles from 0-8 inches; alkalinity: 8.6 from 8-34 inches	Water - slight wind - slight	Probable, with coarse frag-ments in surface and alkalinity in subsoil.
Mulhop	4	Utah juniper	Very gravelly loam	0	Coarse fragments: 0-15 percent cobbles and stones, 50-70 percent pebbles; bedrock: at 17 inches	Water - severe wind - slight	Unsuitable
Gravel pits, pond, outwash aprons, washes	16, 17, 18, 19	NA	Various materials	0	Vary	NA	Unsuitable

Table 3-16 (Continued)

Footnotes:

[1]Based on BLM soil suitability criteria. The soil suitability criteria include:

Sodium Adsorption Ratio:	> 46
Texture:	Excess clays or sands
Coarse Fragments:	> 50 percent by weight
pH:	> 8.5
Salts/salinity:	> 16 mmhos/cm
Erosion Hazard:	Severe, water > 8 (K x S), wind > 100 (I x C)

[2]Soil mapping unit is not located in the project area.

NA = Not applicable.

Source: Soil Conservation Service 1994.

McConnel loams and gravelly fine sandy loams are found on 0 to 8 percent slopes of inset fans in the project area. McConnel soils are very deep, somewhat excessively drained, and moderately permeable and were formed in mixed alluvium influenced by loess and volcanic ash. A typical profile includes loam to gravelly fine sandy loam to a depth of 20 inches and, in the layer below, extrememly gravelly loamy coarse sand to a depth of 60 inches. McConnel soils are probably suitable for reclamation purposes to a depth of 60 inches or greater.

Beoska very stony loams occur on 2 to 8 percent slopes on fan peidmont remnants in the project area. The Beoska series consist of very deep, well drained, moderately permeable soils that formed in loess over loamy and gravelly alluvium derived from mixed parent material. Surface soils usually consist of very stony loams, which are moderately alkaline, underlain by clay loams and gravelly sandy loams, which are strongly alkaline, moderately saline, and moderately sodic. Beoska soils are unsuitable for reclamation activities due to high coarse fragment content and strong alkalinity.

The Oxcorel series consists of very stony loams on 2 to 8 percent slopes, which formed from mixed alluvium somewhat influenced by loess on fan piedmont remnants. Oxcorel soils occur in the project area and are very deep, well drained, and very slowly permeable. A typical profile includes very stony loam, which is moderately alkaline over clay loams and very gravelly sandly loams, which are strongly to moderately alkaline and moderately sodic. Oxcorel soils from the soil surface to a depth of 8 inches are probably suitable for reclamation. Deeper soil layers have a high alkalinity and include a large percentage of coarse fragments.

Mulhop very gravelly loams occur on 30 to 50 percent shoulder slopes and back slopes of mountains in the project area. The Mulhop series consists of shallow, well drained, moderately permeable soils that formed in residuum and coluvium weathered from dolostone and limestone. A typical profile includes soils that are very gravelly loams, which are moderately alkaline over unweathered bedrock. Mulhop soils are unsuitable for reclamation purposes due to shallow depth to bedrock, high erodibility, and high coarse fragment content.

Mapping unit 11 refers to rock outcrop areas that occur on the crests of slopes of the Humboldt Mountains to the east of the project area.

The other mapping units (16 through 19), include gravel pits, ponds, outwash aprons, and washes in the project vicinity. These areas can be considered previously disturbed and are unsuitable for reclamation purposes.

3.5.2 Environmental Consequences

Potential impacts to soils include the disturbance and removal of native soils, alteration of soil profiles and structure, and increased soil erosion resulting from mine construction and operation activities.

Surface soils within the project area were evaluated for reclamation suitability. Threshold values for a soil's suitability as a growth media for reclamation use were based on the following parameters:

- Sodium adsorption ratio - >46 ppm (excess sodium);
- Electrical conductivity - >16 mmhos/cm (excess salinity);
- pH - >8.5 (high alkalinity);
- Soil texture - textures of clay, silty clay, sandy clay, (high clay content) sand, fine sand, very fine sand (high sand content);
- Coarse fragments - >60 percent by weight (high coarse fragment content); and
- Erosion hazard for water or wind - severe.

Surface soils that exceeded these criteria were considered unsuitable for salvage and reclamation. Unsuitable soils have qualities that limit revegetation success and slope stabilization. If volume of salvageable surface soil is insufficient for reclamation purposes, suitable alluvial material would be salvaged and stockpiled for reclamation activities. FCMI is currently conducting chemical

analysis of deeper alluvium to determine their suitability. A depth of 12 inches of suitable growth media is necessary to establish and maintain vegetative growth.

3.5.2.1 Proposed Action

Mine expansion, construction, and operation would disturb approximately 860 acres of native soils as a result of the Proposed Action. Where feasible, surface soils regarded as suitable would be removed, salvaged, and stockpiled for reuse in reclamation activities.

Potential impacts to soil resources include accelerated soil erosion rates and loss of productivity as a result of mining and reclamation activities. Potential soil erosion rates and off-site sedimentation impacts associated with the Proposed Action or Alternatives would be reduced or avoided with the implementation of interim and concurrent reclamation activities described in Section 2.2.15, Reclamation.

Accelerated soil erosion rates may occur during mine operation due to removal or crushing of vegetation, surface soil disturbance, soil compaction, and salvaging and reclamation activities. Plant cover provided by vegetation in the project area would be removed or crushed during mine operation thereby increasing the potential for accelerated erosion rates. Surface disturbances and soil compaction resulting from vehicle use along miscellaneous access roads would reduce the water infiltration rate of soils potentially increasing runoff. Soil salvaging activities would include the stripping of surface and subsurface soil suitable for reclamation activities and the transportation and placement of these soils in growth media stockpiles.

Soil productivity may decrease as a result of mine operations since growth media would be mixed during salvaging and stockpiling activities. Surface soils typically have a higher organic matter content and contain higher nutrient levels than subsurface soils. Soil biological activity (especially with the micorrhizae-root association) and nutrient cycling would be substantially reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of the stockpiles. If growth media were placed over waste rock, the character and texture of the original soils would be altered.

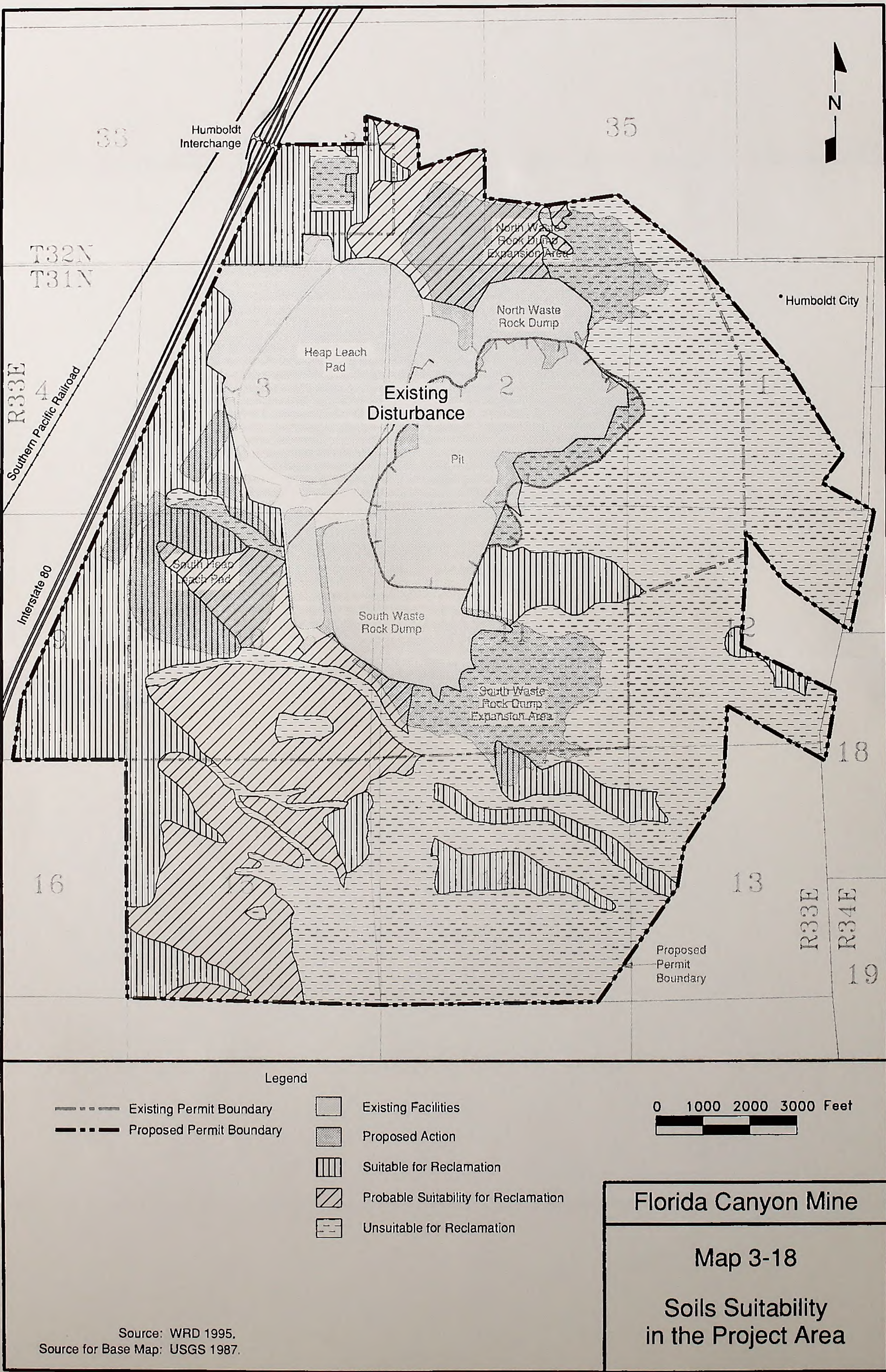
The Proposed Action would disturb approximately 860 acres of soils, of which approximately 1,470,000 cubic yards would be stripped and stockpiled for future reclamation activities (Map 3-18; Table 3-17). Growth media would be used to reclaim approximately 837 acres of disturbed land. Approximately 1,370,000 cubic yards would be necessary for the application of 12 inches of growth media over the 837 acres to be reclaimed. Approximately 1,470,000 cubic yards of growth media would be salvaged, which would result in a surplus of approximately 100,000 cubic yards of growth media.

Nutrient analysis of alluvial material samples collected from the western portions of the Phase 4 and 5 pits was completed in 1997 to identify layers of alluvial material that would be suitable for reclamation. The results of the nutrient analysis indicated that a layer (120 feet deep) of suitable alluvial material occurs in the western portion of the Phase 4 pit area from 4,520 to 4,400 feet. If needed, suitable alluvial material would be salvaged from this area.

Soils that would not be stripped during mine development and operation occur in the growth media stockpile areas and along the livestock water pipeline, and conveyor corridor.

Soils determined to be suitable for reclamation would be stripped from the proposed mine pit expansion, waste rock dump, sediment pond, haul roads, and any other areas that have suitable soils. Impacts to soils would occur during mine development and operation. Soils would be stripped from their original locations, transported to stockpile locations, and dumped.

Reclamation activities would include grading of slopes, re-application of growth media (i.e., salvageable surface and subsurface soil) where necessary, and revegetation for a majority of mine facilities. Reclamation growth media for the remaining 1,107 acres to be reclaimed after mining ceased would be obtained from surplus and stockpiled growth media and suitable alluvial material from the Phase 4 pit.



Florida Canyon Mine

Map 3-18

Soils Suitability in the Project Area

Table 3-17

Growth Media Available for Salvage - Proposed Action

Map Unit Number	Associated Soil Series Name(s)	Acreage in Project Area	Reclamation Soil Salvageable Depth (inches)	Approximate Soil Volume (cubic yard)
1	McConnel, Oxcorel, and Golconda	216	23[1]	670,000
2	Misad	162	32 (depth: 28 to 60 inches)	697,000
6	Wiskan	15	35	71,000
13	McConnel and Oxcorel	30	8[2]	32,000
Totals	NA	423	NA	1,470,000

[1]Depth based on average salvageable depth for the three soil series present.

[2]Depth based on the location, landform type, and drainage pattern of the map unit in project area.

NA = Not applicable.

3.5.2.2 North Extension of the Heap Leach Pad Alternative

General impacts to soils are the same as those described for the Proposed Action. Implementation of this Alternative would disturb a total of approximately 717 acres of soils or about 143 acres less than for the Proposed Action.

Approximately 984,000 cubic yards of growth media would be salvaged and stockpiled for future reclamation activities with this Alternative (Table 3-18). Growth media would be used to reclaim approximately 699 acres of disturbed land. Approximately 1,130,000 cubic yards of growth media would be needed for reclamation. Therefore, an additional 146,000 cubic yards of growth media would be needed for reclamation activities. Suitable alluvial material would be salvaged as growth media for reclamation purposes.

3.5.2.3 No Action Alternative

The additional disturbance of soils associated with the Proposed Action would not occur with the No Action Alternative. Soil impacts would be limited to ongoing, permitted mining, and exploration activities which would cease in 1997. Reclamation of disturbed areas would occur earlier than for the Proposed Action.

3.5.3 Cumulative Impacts

The cumulative assessment area for soil resources includes the 46,502-acre Humboldt House grazing allotment boundary (Map 3-19), of which 23,837 acres are public lands and 22,665 acres are private lands.

Past disturbances within the Humboldt House grazing allotment boundary include approximately 67 acres (Rye Patch Geothermal Project; Minerals Associates, Inc.; miscellaneous mining activities) that were disturbed during previous mining and other development activities. This disturbance accounts for less than 1 percent of the cumulative assessment area. Present disturbances within the cumulative assessment area include approximately 1,259 acres or approximately 3 percent of the allotment. Mine development and operation activities associated with the Proposed Action would result in the disturbance of 860 acres of soils or approximately 2 percent of the cumulative assessment area. No reasonably foreseeable future projects have been identified in the cumulative assessment area.

A total of 2,186 acres of surface disturbance would result from past, present, and proposed mining and other development activities, which represents approximately 5 percent of the cumulative assessment area.

3.5.4 Potential Mitigation and Monitoring

Issue: Soil erosion on reclaimed lands.

Measure: FCMI would coordinate with the BLM to develop appropriate vegetation sampling procedures to monitor revegetation success on reclaimed lands. Plant cover and diversity provided by perennial species are the key vegetation parameters that would be evaluated during vegetation sampling.

Effectiveness: Vegetation sampling would identify any reclaimed areas that do not have sufficient perennial plant cover or diversity to control erosion.

Application: This measure would apply to the proposed project and all project alternatives.

3.5.5 Residual Adverse Impacts

Residual impacts to soils after the Proposed Action would include the removal of approximately 19 acres of soils in the pit area (highwall).

Table 3-18

Growth Media Available for Salvage
North Extension of the Heap Leach Pad Alternative

Map Unit Number	Associated Soil Series Name(s)	Acreage in Project Area	Reclamation Soil Salvageable Depth (inches)	Approximate Soil Volume (cubic yard)
1	McConnel, Oxcorel, and Golconda	228	23[1]	700,000
2	Misad	60	32 of the 28-60 inches subsoil	259,000
13	McConnel and Oxcorel	23	8[2]	25,000
Totals	NA	311	NA	984,000

[1]Depth based on average salvageable depth for the three soil series present.

[2]Depth based on the location, landform type, and drainage pattern of the map unit in project area.

[3]Not applicable.

Florida Canyon Mine

Map 3-19

Cumulative Assessment Area for Soil, Vegetation, and Range Resources

3.6 Vegetation Resources

3.6.1 Affected Environment

The project area is located in the Central Great Basin floristic region of the Intermountain Physiographic Region. This floristic region is characterized by mountain ranges trending north and south with large, extensive valleys located between the mountain ranges. This region covers about 30,250 square miles in central Nevada. Vegetation within the project vicinity includes Utah juniper woodland, which typically occurs above 5,000 feet to sagebrush/shadscale shrubland, which occurs on valley bottoms (SWCA 1996b).

3.6.1.1 Vegetation

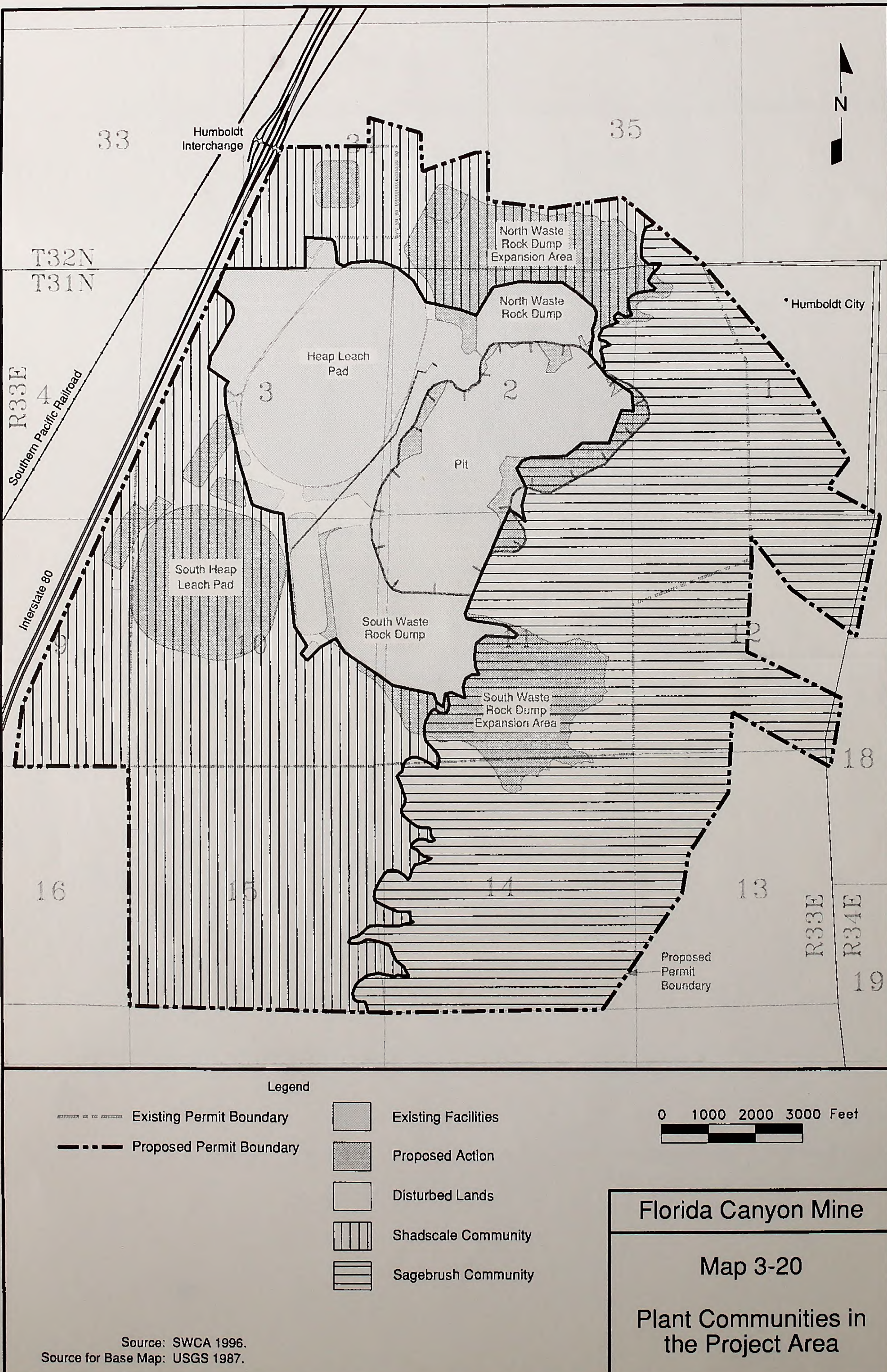
The project area is located in a transitional zone between shadscale and sagebrush communities. Site-specific vegetation studies were conducted in the project area during 1985 (Western Resource Development Corporation 1985) and 1995 (SWCA 1996b), in addition to a study conducted to evaluate revegetation success in reclaimed waste rock dump areas (SWCA 1995). The baseline vegetation studies included the delineation of plant communities based on aerial photograph interpretation and on-site vegetation surveys. Vegetation sampling was completed at representative sites within these plant communities to determine distribution, species composition, forage production, and other vegetative parameters.

Two plant communities that are located in the project area include the shadscale and the Wyoming big sagebrush-black sagebrush communities (Map 3-20). The distribution of these communities is directly related to subtle differences in landscape position and aspect, soil texture, and moisture. A detailed list of plants potentially occurring in the project area is provided in Appendix C.

The shadscale community is predominantly found in the western half of the project area, which is characterized by gently sloping fan terraces. Other predominant shrubs found in this community include budsage, smooth horsebrush, rubber rabbitbrush, sticky leaf rabbitbrush, Nevada ephedra, and greasewood. Big sagebrush and spiny hopsage occur in areas with higher soil moisture. Perennial grasses, occurring in scattered patterns on the landscape, include bottlebrush squirreltail, Indian ricegrass, needle-and-threadgrass, Thurber needlegrass, basin wildrye, Sandberg bluegrass, and various fescues. Characteristic perennial forbs include scarlet globemallow, Mojave gilia, and hawksbeard. Soil series that support the shadscale community include Misad, Golconda, Beoska, and Oxcorel very fine sandy to gravelly to stony loams (Section 3.5, Soils). Total average foliar cover ranges from 10 to 15 percent, of which 70 percent is contributed by shrubs, 25 percent by grasses, and 5 percent by forbs.

The big sagebrush-black sagebrush community occurs in the eastern half of the project area, which is characterized by foothills associated with the Humboldt Range. Black sagebrush occurs on exposed ridges with shallower soils whereas Wyoming big sagebrush is found on deeper soils and along drainages. Other shrubs in the community include low rabbitbrush, shadscale, rubber rabbitbrush, Nevada ephedra, and horsebrush. Utah juniper are sparsely scattered throughout the community above 5,000 feet. Herbaceous cover is sparse and includes rockcress, milkvetch, scarlet globemallow, sego lily, catseye, Indian paintbrush, hawksbeard, basin rayless fleabane, lupines, lousewort, beardtongues, phlox, buckwheat, and death camas. Grasses include bottlebrush squirreltail, Indian ricegrass, Sandberg bluegrass, basin wildrye, and cheatgrass. The major soils underlying this community are the Atlow and Wiskan very gravelly to cobbly loams found on side slopes and the McConnel loams located on inset fans. Average foliar cover is 15 to 30 percent, of which 50 percent is contributed by shrubs, 40 percent by grasses, and 10 percent by forbs (Western Resource Development Corporation 1985).

Two canyons, including Florida and Johnson Canyons, occur within the project vicinity. Drainages within these canyons are classified as intermittent and do not support riparian vegetation.



Florida Canyon Mine

Map 3-20

Plant Communities in the Project Area

Disturbed areas often are dominated by cheatgrass, an introduced, weedy annual species. Other weedy species that are found in the project area include tansy-mustard, tumblemustard, clasping pepperweed, halogeton, prickly lettuce, fiddleneck, and red stem filaree (SWCA 1996b; Western Resource Development Corporation 1985).

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

Mine development and operation would disturb or remove a maximum of 860 acres of vegetation. Mine development and operation would remove or disturb approximately 535 acres of shadscale vegetation, which represents 62 percent of vegetation present in the project area and approximately 325 acres of sagebrush vegetation, which represents 38 percent of the vegetation present in the project area. The removal of mature shrubs would be a long-term impact, since it would take approximately 15 to 20 years after reclamation to establish mature shrubs in the project area.

No riparian areas or wetlands occur within the project area. Therefore, impacts to riparian areas or wetlands would not occur as a result of mine development or operation. Mine development and operation would result in the filling and excavation of 3.1 acres of other waters of the U.S. (i.e., small, intermittent drainages), which support upland vegetation. Impacts to waters of the United States are described in Section 3.3, Water Resources and Geochemistry.

Under the Proposed Action, vegetation would be removed from the waste rock dumps, pit expansion area, haul roads, new sediment ponds, and other proposed facilities. Existing vegetation at the proposed media stockpile sites would be buried by growth media. Disturbance activities include the trampling of vegetation resulting from vehicles and heavy machinery.

FCMI has committed to coordinate with the NDEP and the BLM to minimize the spread of noxious weeds throughout the project area (Section 2.2.14, Environmental Protection Measures and Monitoring). However, minor populations of weedy annual species, such as halogeton, Russian thistle, and cheatgrass, may become established in localized areas for short periods of time. Weedy species rapidly invade disturbed areas and initially hinder the establishment of more desirable perennial grasses and forbs by competing with them for moisture during the initial years following disturbance or seeding.

Comprehensive reclamation would be completed for approximately 1,967 acres of existing and proposed disturbance or 93 percent of the total disturbance area. After mine closure, the pit area is the only project component that would not be reclaimed. Successful revegetation of disturbed land is anticipated to occur approximately 3 to 5 years after reclamation. Reclamation activities would consist of the grading of final slopes, ripping of compacted soil, reapplication of growth media and/or soil amendments, and broadcasting of seed. The proposed seed mixture that would be used for revegetation activities is provided in Table 2-4. After 3 to 5 years, the reclaimed plant communities would likely consist of adequate herbaceous plant cover and diversity to substantially reduce the potential for soil erosion and provide forage for use by livestock and wildlife.

3.6.2.2 North Extension of the Heap Leach Pad Alternative

General impacts to vegetation are the same as those described for the Proposed Action. Mine development and operation would disturb and remove approximately 717 acres of vegetation (533 acres shadscale; 184 acres sagebrush), or 143 acres less than would be disturbed by the Proposed Action. Comprehensive reclamation would be completed for approximately 1,823 acres of existing and proposed disturbance or 92 percent of the total disturbance area. Riparian or wetland areas would not be impacted by mine development and operation for this Alternative. Mine development and operation would result in the filling and excavation of

3 acres of other waters of the U.S. (i.e., small, intermittent drainages), which support upland vegetation. Impacts to waters of the U.S are described in Section 3.3, Water Resources and Geochemistry.

3.6.2.3 No Action Alternative

The additional disturbance of 860 acres of native vegetation associated with the Proposed Action would not occur under the No Action Alternative. Vegetation impacts would be to limited ongoing, permitted mining and exploration activities. Reclamation activities and subsequent revegetation would occur earlier under this Alternative, as compared to the Proposed Action.

3.6.3 Cumulative Impacts

The cumulative assessment area for vegetation resources includes the 46,502-acre Humboldt House grazing allotment (Map 3-19). Past disturbances within the Humboldt House grazing allotment boundary include approximately 67 acres that were disturbed during previous mining and other development activities (e.g., Rye Patch Geothermal Project; Minerals Associates, Inc. Project; miscellaneous mining activities). This disturbance accounts for approximately 1 percent of the cumulative assessment area. Present disturbances within the cumulative assessment area was disturbed or removed vegetation on approximately 1,259 acres or 3 percent of the cumulative assessment area. Mine development and operation activities associated with the proposed project would result in the disturbance or removal of 860 acres of vegetation or 2 percent of the cumulative assessment area.

A total of 2,186 acres of surface disturbance would result from past, present, and proposed mining and other development activities in the cumulative assessment area, which represents approximately 5 percent of the cumulative assessment area. The loss of vegetation during development operation activities would result in the loss of livestock and wildlife forage and protective cover for wildlife. The loss of mature shrubs would be minimal relative to the total acreage of sagebrush and shadscale communities that occur in the cumulative assessment area.

3.6.4 Potential Mitigation and Monitoring

Reclamation activities are included as part of the Proposed Action and would substantially reduce potential impacts to vegetation resources. One monitoring measure for vegetation is discussed in Section 3.4.4 of Soils.

3.6.5 Residual Adverse Impacts

Residual impacts to vegetation would include the permanent removal or disturbance of a maximum of 19 acres of vegetation from the pit area. A long-term change in vegetation composition of 860 acres (i.e., mature shrub-dominated communities to grass- and forb-dominated communities) would occur as a result of the Proposed Action.

Approximately 1,967 acres of disturbed vegetation would be reclaimed after mining ceases. Approximately 152 acres of the combined existing and Proposed Action disturbance would not be reclaimed.

3.7 Wildlife and Fisheries Resources

3.7.1 Affected Environment

3.7.1.1 Aquatic Biology

Surface water in the project area is limited to intermittent streams and isolated springs, as discussed in Section 3.3, Water Resources and Geochemistry. This EIS analysis focused on two springs that are located farther up Florida Canyon and Humboldt Canyon, which occur within the cumulative analysis area.

No fisheries are present in or near the proposed mine expansion area. In the cumulative analysis area, Pitt-Taylor and Rye Patch Reservoirs support existing fisheries, which occur north and west of the mine. Walleye do not naturally reproduce in Rye Patch Reservoir; therefore, the NDOW plants walleye fry in lower Pitt-Taylor Reservoir because of its optimal nursery habitat. Fingerlings then migrate into Rye Patch in the late summer and early fall. Pitt-Taylor is shallow and periodically subjected to changes in water temperature and turbidity. Therefore, specific water quality parameters are critical to its fishery (NDOW 1997).

3.7.1.2 Terrestrial Wildlife

<u>Game Species</u>

Wildlife habitat associated with the project area is limited to two dominant plant communities, the shadscale shrubland community at the lower elevations and the Wyoming big sagebrush-black sagebrush community at the higher elevations, as described in Section 3.6, Vegetation Resources, and shown on Map 3-20. Overall habitat value for wildlife resources ranges from low to moderate, transitioning from the shadscale community on the west side of the project area to the big sagebrush-black sagebrush community in the foothill region of the Humboldt Range.

The project area encompasses arid, upland habitats dissected by ephemeral or intermittent drainages. Available water is the primary limiting factor for wildlife. No naturally occurring seeps, springs, or perennial drainages with associated riparian habitats occur in or near the proposed mine expansion areas. Three prominent drainages include Florida Canyon, Humboldt Canyon, and Johnson Canyon. Although these canyons are ephemeral drainages, they provide higher habitat values for wildlife, when compared to the surrounding areas, based on the amount of upland cover and forage availability, increased plant diversity, and additional moisture. The canyons also provide a natural movement corridor into the project area.

In the cumulative study area, the Pitt-Taylor and Rye Patch Reservoirs are prominent water resources for wildlife use. These areas are particularly valuable for migratory waterfowl, shorebirds, and a variety of raptor species (e.g., bald eagle, golden eagle) (Western Resource Development Corporation 1985). No open water sources provide habitat for water birds in or near the project area.

A number of baseline surveys have been conducted in and adjacent to the proposed mine expansion area. Baseline descriptions of both resident and migratory wildlife include species that have either been documented or may occur, based on habitat associations. Surveys were conducted in 1985 (Western Resource Development Corporation 1985), 1994 (Resource Concepts 1994; BLM 1995), and 1995 (SWCA 1996c, 1996d). These studies examined the overall use of the area by terrestrial vertebrates, surveyed for special status species, and examined existing mine adits and shafts in the Imlay Mining District for evidence of bat use. Representative wildlife species that may occur in and near the project area are listed in Appendix D. Survey specifics pertaining to sensitive wildlife resources are discussed further in Section 3.8, Special Status Species.

Mule deer are the primary big game species in the project area. Management Area 4 deer herds, including the Humboldt Range population, have experienced high winter mortalities over the last several years. The higher mortality rate has been attributed to the relative habitat quality and

quantity of available deer winter range (NDOW 1997; Gebhardt 1997).

The proposed project area is located along lower elevational alluvial fans, which provide important winter range for the Humboldt deer herd. This range is particularly valuable during severe winter periods, when the higher elevational range is unavailable (NDOW 1997). The highest quality mule deer habitat in the vicinity of the mine is located in Florida, Johnson, and Humboldt Canyons (Western Resource Development Corporation 1985) that bisect the project area.

Water availability, forage quality, cover, and weather patterns typically determine the level of use and movement of deer through an area. As discussed above for general wildlife, water also is the primary limiting factor for mule deer in the immediate project area, particularly near high quality forage, which somewhat restricts the resident deer population.

Mountain lions occupy the higher elevations to the east and south of the project area, and follow the resident mule deer populations. Although mountain lions are known to occur along the west flank of the Humboldt Range (Western Resource Development Corporation 1985), the lion population near the project area is likely low, due to the habitat types present, the amount of human presence, and the extent of mule deer use recorded for the mine area.

Upland game birds are not abundant, but may occupy portions of the project area. Sage grouse are native to the Humboldt Range, particularly along the eastern flank (Western Resource Development Corporation 1985). Sage grouse generally occupy upland shrub communities, breeding on open leks (or strutting grounds) and nesting and brooding in upland areas and meadows in proximity to water. Due to previously low population levels of sage grouse, the NDOW reintroduced this species into the Humboldt Range in 1990. However, no sage grouse sightings have been reported since 1992; the current population levels in the Humboldt Range are believed to be very low (NDOW 1997). In addition, no potential leks or brooding habitat for sage grouse have been identified in or near the project area (SWCA 1996c). The NDOW also reintroduced mountain quail into the Humboldt Range in 1993. Mountain quail are typically associated with dense brush, forest edges, and mountain meadows, in proximity to water (U.S. Forest Service 1991). Although population levels of this game bird also are believed to be low, one of the last sightings of mountain quail was in Humboldt Canyon located to the north of the proposed project area (NDOW 1997). Mourning dove occur in and near the project area (SWCA 1996c), particularly along the drainages bisecting the region. Habitats associated with the proposed mine expansion area are not so limiting for this upland game bird, as compared to other species.

Both chukar and California quail have been introduced into the Humboldt Range. However, these populations are considered low in and near the project area. Chukar are commonly found in dry sagebrush and grasslands, often along rocky slopes, mesic habitats, and rugged canyons (Terres 1991). Habitat in the project area is considered limiting for chukar nesting and brooding (SWCA 1996c). California quail often occupy dry foothills and valleys that maintain low trees and shrubs with openings for foraging in proximity to water sources (Terres 1991). Appropriate habitat in the project area also is restricted for this species.

To offset past mining impacts to big game and upland game bird species, FCMI and the NDOW established three wildlife guzzlers along the perimeter of the existing mine boundary. Two of these guzzlers were developed primarily for small game species; the third provides water for big game (i.e., mule deer).

<u>Nongame Species</u>

Nongame species are widely distributed, occupying a variety of habitat types and elevations within the project region. Representative nongame mammals are listed in Appendix D.

Important nongame species include several bats that may occur in the project area. Abandoned shafts, adits, and other underground workings can

support both breeding and hibernating bat species. A number of these features were examined in July and August of 1995 (SWCA 1996d). Since many of the bats identified for this project are currently protected on BLM lands, they are discussed in detail in Section 3.8, Special Status Species.

Nongame birds encompass a variety of passerine and raptor species. Representative bird species are presented in Appendix D. Nongame birds include a diversity of neotropical migrants; birds that breed in North America and winter in the neotropical region of South America. These bird species are considered integral to natural communities, as they often act as environmental indicators.

Passerines or perching birds occupy the entire range of habitats that occur within the project area. However, the canyon systems and the Wyoming big sagebrush/black sagebrush community support a greater number of birds than the lower shadscale community.

Nesting raptors recorded for the immediate project area have been limited to buteos; specifically, red-tailed hawks. Historically, several red-tailed hawk nests occurred in the mine area. One red-tailed hawk nest was previously recorded in Florida Canyon in the project area (Western Resource Development Corporation 1985). This nest was not observed during the 1995 surveys (SWCA 1996c). A second red-tailed hawk nest occurs in Humboldt Canyon, on the north edge of the project area (Western Resource Development Corporation 1985). This nest was observed during the 1996 field reconnaissance, although it's status is presently unknown. A third red-tailed hawk nest occurs approximately 5 miles south of the mine (NDOW 1997). A fourth hawk nest has been documented north of the mine area near historic Humboldt City, which occurs outside of the project area.

No habitat in or adjacent to the proposed mine expansion area would be considered suitable for accipiter nesting. However, a northern goshawk nest has been documented approximately 2 miles south of the project area (NDOW 1997).

The specific locations of these historic and active nest sites have not been disclosed in this EIS to ensure the protection of the nests and the breeding birds associated with these sites. Based on surveys conducted to date and associated habitat values, the potential for raptor nesting or foraging is limited in the immediate mine area and is considered low to moderate in the areas adjacent to the proposed expansion.

A number of other raptor species may use the project area and its surrounding habitats for foraging and possibly nesting, although suitable breeding habitat is limiting. Appendix D lists the raptor species identified for the project region. Details on sensitive birds, such as the bald eagle, ferruginous hawk, northern goshawk, and burrowing owl are discussed further in Section 3.8, Special Status Species.

Other nongame species in the project area would include common reptiles such as those described in Appendix D. Amphibians would be limited in the immediate project area, due to the lack of water sources. However, amphibians occur throughout the project region.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

No impacts to aquatic resources would be expected from the proposed mine expansion activities. This determination is based on three primary factors. First, the proposed project would not directly affect any natural perennial water sources, since none are located within the proposed disturbance areas outlined by the project components. Second, no indirect effects would be anticipated to the naturally occurring springs associated with Florida Canyon or Humboldt Canyon, based on the analysis presented in Section 3.3, Water Resources and Geochemistry. Third, as discussed below for terrestrial species, no adverse impacts to Pitt-Taylor or Rye Patch Reservoirs have been identified for this proposed project from potential water drawdown effects or hazardous chemical releases. Previous water use agreements and permitting activities are beyond the scope of this

EIS; therefore, no changes to surface water allocations would occur as a result of this project. Also, FCMI recently constructed containment structures on-site to prevent any future release of hazardous chemicals from migrating downgradient toward Pitt-Taylor Reservoir. These issues are discussed further for terrestrial resources. In summary, no impacts to fisheries, aquatic invertebrates, or other wildlife species that are dependent on local water resources would occur from the implementation and reclamation of the proposed project.

Two existing stock tanks located on the north and west side of the mine would be relocated as a result of this mine expansion. However, these resources would continue to be available for wildlife use; therefore, no adverse impacts from moving these artificial water sources have been identified.

The degree of impacts to terrestrial species and their associated upland habitats typically depends on the temporal and spatial relationships of these resources with the proposed project components. In review of the existing mine operations, relative to both resident and migratory wildlife and their associated habitats, the overall effects to area wildlife species from the proposed mine expansion would be considered low to moderate. Direct impacts would include habitat loss and encroachment into the Humboldt Range foothill region, increased habitat fragmentation, animal displacement, and some limited direct mortalities. Indirect impacts would primarily encompass increased noise and expanded human presence.

Generally, mine development results in the loss of the less mobile species and the displacement of animals from the project area into adjacent habitats, which are typically assumed to be at or near their carrying capacities. Therefore, displaced animals, which would increase intraspecific competition, would be assumed to be lost from the population. Displacement of wildlife from project-related activities would primarily affect those species dependent on the transitional foothill zone located between the lower elevational shadscale community and the higher elevational habitats. However, a number of existing elements would limit both the direct and indirect effects to wildlife resources from implementation of this project. These considerations include: 1) the existing mining operations have resulted in declining wildlife population numbers in and immediately adjacent to the project area, thereby reducing the associated habitat carrying capacities to their current levels; 2) the project area occurs adjacent to I-80, also which has reduced the number and diversity of animals occurring in the area; 3) the habitats in the project area that would be affected are not considered unique; 4) no perennial water sources or other limiting factors for area wildlife occur within the proposed disturbance area; and 5) FCMI has been recognized for its successful reclamation efforts. The primary concern identified for terrestrial wildlife resources would be the incremental loss of native habitats, as the mine would expand farther into the foothill region of the Humboldt Range, resulting in both direct and indirect impacts. The expanded mine exploration activities also could impact local wildlife species.

Implementation of the proposed project would result in the direct loss of a maximum of 860 acres of native vegetation. The loss of the 860 acres would be considered a short-term impact during the life of the project until final site reclamation is completed. Of the 2,119 total acres of native habitats disturbed by previous mining and the proposed project, 1,967 acres would be reclaimed, leaving 152 acres not reclaimed for post-mining use (Table 2-6). The 152 unreclaimed acres would be considered a long-term and permanent habitat loss.

FCMI has proposed a reclamation plan, as discussed in Section 3.6.6, Reclamation. As stated above, the mine has been previously recognized for its successful reclamation efforts; this plan tiers off of these efforts. The proposed project would result in short-term loss of native habitats and forage availability in the project area. The long-term impacts to wildlife resources from habitat loss would be the removal of mature, woody shrubs. Following mine reclamation, it would require 15 to 20 years for mature shrubs to become re-established.

The primary adverse impact from the proposed project would be the loss of a maximum of 860 acres of mule deer winter range (NDOW 1997), resulting in both short- and long-term effects. Habitats would not be re-established until final reclamation is completed. Of this 860 total acres, approximately 841 acres would be lost for the life of the project (short-term). An additional 19 acres would be lost over the long-term. This loss of deer winter habitat would adversely affect a portion of the Humboldt Range mule deer population. No big game migratory or movement corridors would be affected by the proposed project (NDOW 1997). Impacts to mountain lions would be the loss of mule deer habitat, which would indirectly affect mountain lion distribution.

Potential impacts to other mammals are discussed further in Section 3.8, Special Status Species.

Avian species that could be impacted would include potentially nesting raptors and nesting passerines primarily associated with habitats adjacent to the proposed mine expansion areas. In the event that project development were to occur during the breeding season (March through July) in proximity to active nest sites, mine development (including exploration activities) could result in the loss of eggs or young. However, impacts to nesting birds would depend on the nest location relative to the proposed disturbance, the phase of the breeding period, and the duration of the anticipated disturbance. Loss of or disturbance to an active nest site could adversely affect breeding birds, potentially resulting in nest abandonment, loss of the territory, and loss of productivity for that breeding season, which would be in violation of the Migratory Bird Treaty Act.

Based on the location of the proposed expansion areas, no existing raptor nests would be directly disturbed by the proposed project. However, breeding raptors may be indirectly affected by mine development activities (e.g., noise, human presence), if an occupied territory or active nest site occurred within 0.5 mile line-of-site of mine development activities, including mine exploration. No adverse impacts to the existing red-tailed hawk nest or the northern goshawk nest located approximately 5 and 2 miles south of the mine area, respectively, would be anticipated, based on the distance of these nest sites from the expansion areas and that no effects to available water sources or associated riparian habitat have been identified.

Potential impacts to nesting passerines from mine development would be limited to species that either nest on the ground or in low-growing shrubs. Based on relative habitat associations that would be removed by the proposed project, no rare or unique songbirds would likely be affected by the mine expansion. Adverse effects to passerines would primarily be the cumulative habitat loss, as discussed below in Section 3.7.3, Cumulative Impacts.

Placement of new distribution lines can result in an increased potential for raptor electrocution attempting to perch on the powerline structures. Therefore, the proposed addition and operation of the new power distribution line located along the western perimeter of the mine area would pose a low electrocution threat to area raptors. This impact is rated low, due to the short distance of the line. Potential avian line strike hazards would be considered negligible. Collision potential is typically dependent on variables such as the location of high-use habitats (e.g., nesting, foraging, roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design (Beaulaurier et al. 1982; Anderson 1978). Based on the location and orientation of the small distribution line spur, no increased potential for avian line strikes would likely occur.

Potential effects to upland game birds from mine development are expected to be low. The lack of known breeding sites (e.g., sage grouse leks), the limited habitat quality in the proposed expansion area, and the lack of water sources that would support brooding birds limit the overall potential for sage grouse, mountain quail, chukar, and California quail in the project area. No direct or indirect impacts would occur to Humboldt Canyon or the upper portions of Florida and Johnson Canyons that are considered important

habitat for upland game birds (e.g., mountain quail).

Impacts to high-profile species from increased human presence is typically proportional to the size of a construction and operational work force, overall land use and recreational demands, and other development and associated activities in the region. During the 1-year construction period, the construction work force for the proposed mine expansion would peak at 104 additional employees for a 1- to 2-month period, as described in Section 3.13, Social and Economic Values. This short-term increase in people in and near the mine site could result in increased noise, wildlife harassment, and vehicle-related mortalities. However, this incremental increase in the number of mine personnel would not likely result in significant adverse effects to local wildlife resources. First, future noise levels would not be expected to increase substantially beyond existing levels, as presented in Section 3.12, Aesthetics. Therefore, no additional noise effects would occur. Second, since the mine is located near I-80, the potential for a large increase in vehicle-related mortalities would be limited to the immediate expansion area. Based on the location of these areas relative to roads and I-80, road kills would likely be minimal. Finally, the increased number of personnel during mine construction could result in additional dispersed recreation (e.g., off-road vehicle use) along the Humboldt Range, possibly resulting in increased wildlife harassment. Poaching is often the greatest adverse impact to wildlife from increased human presence (Streeter et al. 1979), particularly for big game species. However, other high-profile species are often harassed, including large raptors (e.g., eagles and buteos), predators (e.g., coyote), and roosting bats in caves and mine workings. Although these impacts could occur from the anticipated increase in construction personnel, the effects would be short-term and would be expected to return to current levels following mine development.

The EIS analysis examined the potential short- and long-term effects from both water quality and water quantity for wildlife resources. It was determined that the proposed project would not result in adverse impacts from degraded water quality or decreased water availability, as discussed below.

Short-term effects from water quality would be limited to the potential exposure of terrestrial wildlife to cyanide solutions used on-site. Sodium cyanide is lethal to wildlife, and recent information provided by the NDOW indicates that certain bat species exhibit a delayed influence from cyanide poisoning. These study results suggest that an increased number of bats may be affected by cyanide solutions than previously thought, and individuals may be succumbing to cyanide poisoning away from mine areas. Therefore, these mortalities would be less likely to be found and reported.

According to FCMI's mortality data that are submitted to the NDOW, very few animals have been impacted by ingesting cyanide solutions during the mine's operation. All cyanide-related mortalities reported since 1987 were passerines, waterfowl, or shorebirds, averaging less than three birds killed per year. As part of the proposed project, FCMI has committed to fencing and netting cyanide solution ponds and secondary containment structures to exclude wildlife from potentially lethal solutions. These measures are described in Section 2.14, Environmental Protection Measures and Monitoring. According to the NDOW's Artificial Industrial Pond Permit requirements, if a mine has an overflow pond that contains cyanide solution 2 days out of 5, then either exclusion devices are required or the mine must neutralize the cyanide immediately. FCMI has proposed to construct storm event ponds adjacent to solution overflow ponds for any potential cyanide solution overflow, which would contain a 25-year/24-hour storm event, in addition to 110 percent of the largest process tank. The proposed diversion channels and sediment ponds also are designed to withstand a 100-year, 24-hour precipitation event. FCMI has committed to netting and fencing these new solution ponds, event ponds, and overflow ponds, in order to protect wildlife resources. Emitters and sprinklers have been proposed for the heap leaching process. These areas would be monitored to prevent cyanide pooling or wildlife access, if pooling results (Section 2.2, Proposed Action).

Based on FCMI's committed protection measures, potential impacts to wildlife resources from cyanide ingestion would be low. These measures have been developed in accordance with the BLM's cyanide management policy and the NDOW's Industrial Artificial Pond Permit. FCMI is required to report all wildlife mortalities to the BLM and NDOW, as required by the Federal and state approval and permitting processes.

No potential impacts to wildlife from future pit lake water quality would occur. As discussed in Section 3.3, Water Resources and Geochemistry, the proposed backfilling of the pit would eliminate a pit lake forming upon mine closure. Therefore, no adverse effects would occur to wildlife from ingestion of pit lake water or the possible bioconcentration of certain chemicals of concern, thereby avoiding possible acute or chronic toxicity issues.

The potential for drawdown of naturally occurring water resources in the mine vicinity from dewatering activities conducted during mine operations are presented in detail in Section 3.3, Water Resources and Geochemistry. Given these groundwater data, no direct or indirect impacts to surface water resources are anticipated from implementation of the proposed project. Therefore, no impacts have been identified for either of the naturally occurring springs in Florida and Humboldt Canyons, other water resources in the cumulative effects area (e.g., Rye Patch and Pitt-Taylor Reservoirs), or the wildlife species dependent on these perennial water sources.

No additional impacts to natural resources would occur from the transport or use of hazardous chemicals associated with the proposed project. As presented in Section 3.15, Hazardous Materials, there would be no incremental increase in the use of sodium cyanide, sodium hydroxide, or diesel fuel, as part of the proposed mine expansion; therefore, no additional risks to wildlife and associated habitats would occur from a potential chemical spill during truck transport. The mine experienced a cyanide spill in 1996 that migrated from the mine north toward I-80 and Pitt-Taylor Reservoir. Because of concerns that future spills could affect natural resources in proximity to the mine (NDOW 1997), FCMI recently constructed additional containment structures to prevent the release of hazardous chemicals from reaching sensitive areas, such as Pitt-Taylor Reservoir. In addition, FCMI has an Emergency Response Plan, as discussed in Section 2.2.13.2, Spill Prevention and Emergency Response. Based on these measures, no additional adverse effects would be anticipated, except for extending the chances of a spill for the life of the project.

3.7.2.2 North Extension of the Heap Leach Pad Alternative

Overall impacts from implementation of the North Extension of the Heap Leach Pad Alternative would parallel those described for the proposed project. This alternative would result in the direct loss of a maximum of 717 acres of native vegetation. The loss of this acreage would be considered a short-term impact during the life of the project, until final site reclamation is completed. Of the 1,982 total acres of native habitats disturbed by previous mining and this alternative, 1,823 acres would be reclaimed, leaving 159 acres not reclaimed for post-mining use (Table 2-8). The 159 unreclaimed acres would be considered a long-term and permanent habitat loss.

3.7.2.3 No Action Alternative

Under the No Action Alternative, approximately 860 acres of native wildlife habitat would not be disturbed or lost, as under the proposed mine expansion. Additional habitat fragmentation and animal displacement would not occur, limiting the effects to natural resources to existing conditions. No additional impacts to nesting birds, including raptors and passerines, would occur. The levels of human use would remain the same as the current levels.

3.7.3 Cumulative Impacts

A cumulative effects analysis area typically varies with the resource, its associated habitat types, issue sensitivity, and the animal's mobility. For wildlife resources, the cumulative analysis focused

on the historic mining activities combined with current mining exploration programs and their effects to mule deer winter range. The cumulative effects area examined for wildlife resources expanded from the mine area to include both Pitt-Taylor and Rye Patch Reservoirs. The primary interrelated projects applicable to wildlife resources would be the mining activities that have occurred in the Imlay Mining District; present mining and exploration activities; and the proposed mine expansion and exploration.

The cumulative impact analysis focused on the regional resources and how they may be susceptible to the cumulative actions identified for this project. The analysis assumed that: 1) human use of the cumulative effects area would continue to increase with or without implementation of the proposed project, 2) wildlife habitats are currently at their respective carrying capacities in and adjacent to the proposed mine expansion area, and 3) the overall region has been previously affected by the historic and current mining activities.

No impacts to perennial water or aquatic resources were identified within the cumulative effects area, since no adverse effects to water resources would result from implementation of the proposed project. Cumulative effects to wildlife resources would be directly related to total habitat loss, fragmentation, and animal displacement that have primarily resulted from historic mining activities in the cumulative assessment area, forcing animals into smaller patches and limited distributions. Combined with these past effects, these resource issues also would be affected by the present and planned mining exploration activities. Wildlife populations (e.g., mule deer) that occur in the cumulative effects area would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from the incremental development.

A portion of the present and reasonably foreseeable actions would be eventually reclaimed. Subsequent reclamation would restore the habitats to a certain extent. The reclaimed areas would still be capable of supporting wildlife use, but species' composition and densities would change.

Overall cumulative impacts from the interrelated projects would parallel those discussed for the proposed project. The increased number of roads from mine exploration would improve human access into more remote areas. The work forces associated with mining construction and operation would increase traffic levels in the region, in addition to increasing the employees' exposure to the area. This exposure would typically result in additional human use of the region, increasing pressure on resident wildlife populations. Certain resources are more susceptible to impacts than others, such as riparian zones, seeps and springs, seasonal ranges, movement corridors, and active breeding sites (e.g., leks, raptor nests, brooding habitat). As stated for the proposed project, impacts to high-profile species are proportional to the increase in human presence, land use and recreational demands, and other regional development. The location of these natural resources, relative to the duration of the human disturbance, is pertinent to the degree or level of anticipated cumulative impacts. Effects from the proposed project and interrelated projects would add to overall habitat fragmentation, animal displacement, and avian nesting within the cumulative assessment area. However, notable impacts to wildlife resources would be limited primarily to the loss of mule deer winter range associated with the project area.

Specifically, the cumulative impacts to mule deer would be the incremental loss of important, low elevational winter range from past, present, and reasonably foreseeable mining activities. The encroachment of the Florida Canyon Mine into the foothill region would result in cumulative adverse effects to the Humboldt Range mule deer population, particularly the Management 4 deer herd.

3.7.4 Potential Mitigation and Monitoring

Issue: Loss of mule deer winter range from project development.

Measure 1: FCMI would coordinate with both the BLM and the NDOW to develop appropriate mitigation measures for loss of mule deer winter range, habitat fragmentation, and animal displacement. Examples of applicable mitigation could include the placement of additional water guzzlers in and near the project area, off-site habitat enhancement, etc.

Effectiveness: Habitat enhancement for mule deer would help offset the cumulative loss of deer winter range in the foothill region of the Humboldt Range, supporting the resident deer population.

Application. This measure would apply to the proposed project and all project alternatives, except for the No Action Alternative.

Issue: Disturbance of breeding raptors within 0.5 mile of the proposed project development areas.

Measure 2: In the event that project initiation and exploration activities would occur during the nesting season for raptors (March 1 through June 15), a raptor survey would be conducted within appropriate habitat prior to disturbance to determine if any breeding raptors or active nest sites occurred within 0.5 mile of the proposed disturbance areas. Appropriate habitat would include areas supporting trees or large shrubs, cliff faces, rock outcrops, and intermittent drainages. If occupied raptor territories or active nest sites were located, the BLM and NDOW would be contacted. Applicable mitigation measures would be developed with the agencies; these measures would depend on the level of anticipated impacts (e.g., line-of-sight versus topographical shielding) and could include nest avoidance, establishing buffer areas during nesting, moving the nest site, or erecting nest platforms. Any subsequent mitigation measures would be conducted in accordance with the guidelines established by the Migratory Bird Treaty Act.

Effectiveness: Raptor surveys would identify any breeding activity that could be disturbed by mining activities. Additional protection measures, if needed, would minimize the loss of annual productivity for the breeding birds.

Application: This measure would apply to the proposed project and all project alternatives, except for the No Action Alternative.

Issue: Potential raptor electrocution from perching on distribution line structures.

Measure 3: FCMI would design the distribution line structures in accordance with the updated *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996.*

Effectiveness: Appropriate line design for the proposed distribution line spur would alleviate potential electrocution to perching raptors.

Application: This measure would apply to the proposed project and all alternatives, except the No Action Alternative.

Issue: Loss of habitat diversity and microhabitat components for long-term wildlife use.

Measure 4: FCMI would stockpile boulders during mine development to be used for rock outcrops during final reclamation activities. These boulders would be taken from materials determined not to be acid generating. FCMI would coordinate with the BLM to determine best placement location and orientation, as part of the final engineering design.

Effectiveness: The placement of boulders to form rock outcrops during mine reclamation would aid in restoring certain microhabitat features for wildlife and plants that are considered keystone species for the natural communities.

Application: This measure would apply to the proposed project and all alternatives, except the No Action Alternative

3.7.5 Residual Adverse Impacts

Residual effects to wildlife resources from the Proposed Action would include the short-term loss of 860 acres and long-term loss of 78 acres of native habitat. Other residual impacts would include the displacement of mule deer and other wildlife species (e.g., passerines, bats). Increased human presence would continue to affect the overall distribution of wildlife.

Approximately 1,967 acres of disturbed habitat would be reclaimed after mining ceases. Approximately 152 acres of the combined existing and Proposed Action disturbances would not be reclaimed.

3.8 Special Status Species

3.8.1 Affected Environment

Federal and state agencies identified a few sensitive wildlife species that may occur in the vicinity of the project area and cumulative assessment area (U.S. Fish and Wildlife Service [USFWS]; Nevada Natural Heritage Program [NNHP] 1997). Although a number of sensitive terrestrial and aquatic species occur in northern Nevada, few species have been documented for the project area.

Table 3-19 lists the special status species analyzed in this EIS, which encompasses Federally listed and BLM Species of Special Concern. In support of this document and previous mine expansions, baseline surveys also have been conducted in and near the project area (Western Resource Development Corporation 1985; Resource Concepts 1994; BLM 1995; SWCA 1996c and 1996d). Survey results are included in the following species' discussions, where applicable.

In accordance with the Endangered Species Act of 1973, as amended, the lead agency in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a Federally listed threatened or endangered species. It is the BLM's current policy that Federal candidate species and Species of Special Concern also be managed to prevent a future Federal listing as threatened or endangered.

The USFWS revised the Federal candidate species list, omitting categories 1, 2, and 3 and developing a "candidate" list only, which is primarily composed of previous category 1 species and a few category 2 species that were upgraded. This Notice of Review was published in the Federal Register on February 28, 1996. The Nevada BLM subsequently developed interim guidelines on March 20, 1996, for the protection and conservation of the majority of category 2 species that were omitted from the USFWS's listing and have historically been protected as BLM Special Status Species. Therefore, these former category 2 species in Nevada that are not included in the USFWS's new candidate listing are currently incorporated into the Nevada BLM Sensitive Species List and referred to as "Species of Special Concern." The following discussion summarizes known data for the sensitive wildlife species initially identified for the proposed project by the applicable agencies.

3.8.1.1 Plants

One BLM Species of Concern, the Bruneau River prickly phlox, has been recorded within 2 miles of the project area (NNHP 1997). Suitable habitat for four additional BLM Species of Special Concern occurs along washes and windswept ridges in the project vicinity. These species include the windloving buckwheat, Nevada oryctes, Nevada dune beardtongue, and obscure scorpion plant.

No documented populations of these special status plant species have been observed in the project area. All cacti and yuccas are protected by Nevada state law, but none of these species were recorded for the project area (Western Resource Development Corporation 1985; SWCA 1996b).

3.8.1.2 Birds

The American peregrine falcon is currently listed as endangered, but has been proposed to be Federally delisted. The arctic peregrine falcon has been delisted; however, migrants are still protected under the similarity of appearance provision of the Endangered Species Act and the Migratory Bird Treaty Act. Nesting peregrine falcons prefer cliffs in proximity to water and typically forage in riparian zones where avian prey species (e.g., passerines, shorebirds) are abundant (USFWS 1984). Studies in Colorado have reported that peregrines may travel up to 31 miles from occupied eyries to obtain prey (Craig 1994). No occupied territories or active peregrine eyries are known to occur in the vicinity of the project area. In addition, no primary foraging habitat (e.g., riparian zones) occur in the project area. Peregrine use of the project and cumulative assessment areas would be limited to migrating birds.

Table 3-19

Special Status Wildlife Species Identified for the Proposed Project

Common Name	Scientific Name	Federal Status[1]	Occurrence in the Project Area and Vicinity[2]
BIRDS			
Peregrine falcon	*Falco peregrinus*	E[3]	M
Bald eagle	*Haliaeetus leucocephalus*	T	W, M
Ferruginous hawk	*Buteo regalis*	BLM	R - V
Northern goshawk	*Accipiter gentilis*	BLM	R - V
Burrowing owl	*Athene cunicularia*	BLM	R - V
MAMMALS			
Pygmy rabbit	*Brachylagus idahoensis*	BLM	U
Small-footed myotis	*Myotis ciliolabrum*	BLM	R-V
Long-eared myotis	*Myotis evotis*	BLM	U
Fringed myotis	*Myotis thysanodes*	BLM	U
Long-legged myotis	*Myotis volans*	BLM	U
Pale Townsend's big-eared bat[4]	*Corynorhinus townsendii pallescens*	BLM	U
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	BLM	R
Spotted bat	*Euderma maculatum*	BLM	U

[1]E = Endangered: A species in danger of extinction throughout all or a significant portion of its range.
T = Threatened: A species likely to become endangered within the foreseeable future through all or a significant portion of its range.
BLM = BLM Species of Special Concern: Previously Federal candidate-category 2 species. Currently protected by the BLM in Nevada under the agency's state guidelines, dated March 20, 1996.
[2]R = Resident: This species has been documented in the project area.
R-V = Resident in Vicinity: This species has been documented in the project vicinity, which includes habitats surrounding the project area.
W = Winters: This species winters in the vicinity of the project area.
M = Migrates: This species is known to migrate through the project area.
U = Unknown: It is currently unknown whether this species occurs in the study area or vicinity; however, appropriate habitat is present.

[3]Currently proposed to be delisted; final decision is pending.

[4]Taxa known to occur in Nevada, but ommitted in error from the historical range listed in the USFWS's 1994 Animal Notice of Review.

The USFWS recently downlisted the bald eagle to Federally threatened from endangered status (USFWS 1995). No bald eagle nesting habitat occurs in or near the project area; however, migrating eagles do move through the state, and wintering birds would occur within the appropriate winter habitats from December through March. These habitats for wintering birds generally include open water and upland habitats for foraging. In addition to open water, other important habitat components for wintering eagles include suitable trees for diurnal perching and night roosting (Terres 1991; USFWS 1986). Bald eagle wintering habitat exists along the Humboldt River and the Pitt-Taylor and Rye Patch Reservoirs. Wintering birds may forage along the river and reservoirs, when open water permits. Eagle presence in the immediate project area would be infrequent and limited to occasional foraging in the upland habitats.

The ferruginous hawk is a common breeder in many areas of Nevada. This species often nests on trees, promontory points, rocky outcrops, cut banks, or on the ground (Terres 1991). Preferred breeding habitat in most of the state is scattered juniper trees at the interface between piñon-juniper and desert shrub communities that overlook broad valleys used for foraging (Herron et al. 1985). Ferruginous hawks historically nested along the western flank of the Humboldt Range, and individual birds have been documented a number of times in the project region. Although, preferred habitat for ferruginous hawks does not currently occur in the project area, and the isolated junipers east of the mine would not be considered optimal nesting habitat, birds may nest and forage along the foothill region of the Humboldt Range.

The northern goshawk is an uncommon forest species that is a year-long resident, breeding in the mountains and wintering in the lower foothills and valleys (Herron et al. 1985). In Nevada, this species is generally associated with aspen riparian habitat (Herron et al. 1985) and is susceptible to disturbance during nesting. One historic goshawk nest or breeding territory has been documented in the vicinity of the project area. This nest is located approximately 2 miles south and east of the project area (NDOW 1997). No suitable nesting or foraging habitat occurs in the project area, although this species may forage in the region, particularly in the higher elevations of the Humboldt Range.

The burrowing owl is an uncommon summer migrant that breeds in portions of Nevada. It is dependent on abandoned mammal burrows for nesting, typically foraging in open grasslands and sagebrush habitats. This owl feeds on insects and small rodents, taking some reptiles, amphibians, and small birds (Terres 1991). Suitable habitat (i.e., shadscale and sagebrush communities) for this species does occur in the project area. No burrowing owls or associated sign were observed, however, during the 1995 field surveys (SWCA 1996c).

3.8.1.3 Mammals

The pygmy rabbit is distributed throughout the northern Great Basin. Habitat requirements for these small, burrowing rabbits include dense stands of big sagebrush or bitterbrush for both food and cover (Green and Flinders 1980) and deep, friable soils for their burrows (Wilde 1978). The species has an irregular distribution, limited to suitable stands of sagebrush and rabbitbrush (Dobler and Dixon 1990). Sagebrush is important forage for this rabbit and is consumed year-round. In Nevada, the pygmy rabbit also is considered a game species. Habitats in the project area are not considered optimal to support pygmy rabbits. The sagebrush communities in the project area do not provide the habitat components typically required by this species (Resource Concepts 1994; BLM 1995; SWCA 1996c). Therefore, the potential for this species to occur on the project site is considered very low (SWCA 1996c).

Federal and state agencies identified the following sensitive bat species as potentially occupying the appropriate habitat types in and near the project area. Rock outcrops, caves, mine shafts and adits, cliffs, trees, and buildings could provide day roost sites; caves and mines may be used for hibernacula or maternity roosts. In July and August of 1995, 13 shafts and adits located in the project vicinity were examined to determine the potential presence of the following bat species. The surveys also examined habitat suitability, species diversity, and bat distribution (SWCA 1996d).

Three complexes were examined within the project vicinity, including the Starlight, Florida Canyon, and Piedmont Mine Complexes. Although three small-footed myotis were mist netted near the Florida Canyon Mine Complex, there was no evidence of bat use within either the Starlight or Florida Canyon workings. It was apparent, however, that bats use the limited open water resources located within the Florida Canyon drainage for foraging (SWCA 1996d).

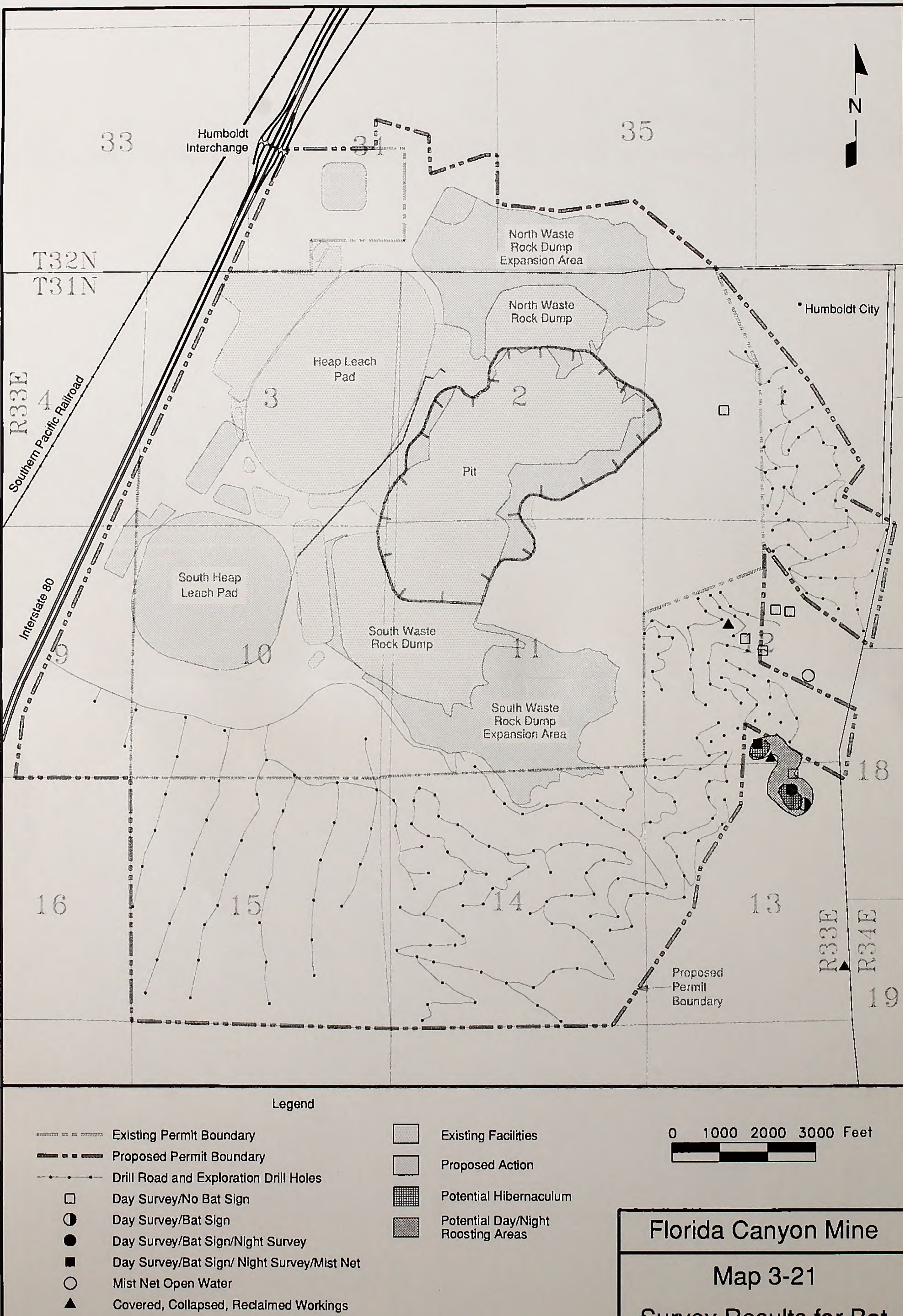
The Piedmont Mine Complex does support roosting bats, based on sign observed during the 1995 summer surveys. Three underground features within this complex are deep, multi-leveled workings that contained varied concentrations of bat sign. However, due to the complexity of these three workings, only the main (portal) levels were examined; additional bat use is likely in the deeper portions of these sites. It was inferred, based on associated sign, two of these three sites are likely hibernacula for winter roosting and all three provide day roost sites for area bats. It also was documented that the Townsend's big-eared bat is present at least a portion of the year. Map 3-21 shows the survey sites and likely roost areas (SWCA 1996d).

The following background information on sensitive bats was summarized, using a variety of sources, including the *Bats of Nevada* (no date) and *General Life History of Nevada Bats* (no date). Potential presence in the project area is summarized from field surveys conducted in and near the project area (SWCA 1996c, 1996d) and from potential habitat suitability. Scientific names are provided in Table 3-19.

The small-footed myotis is a summer resident in Great Basin desert, shrub-steppe, and woodlands, with occasional reports in montane forests. It inhabits rocky areas and forages for insects in clearings, near rocks, and over forests. It is known to hibernate in caves and mines, and summer roosts have been recorded in buildings and mines, under tree bark, and beneath rocks. Few data exist on its reproductive biology (Arizona Game and Fish Department 1993; Colorado Division of Wildlife 1984; Fitzgerald et al. 1994). This bat was observed during the 1995 field surveys foraging over open water located along the eastern portion of the study area. This presence would suggest that suitable roosting habitat occurs in or near the project area; however, no small-footed myotis were found in any of the abandoned mine workings that were surveyed in 1995 (SWCA 1996c, 1996d).

The long-eared myotis is a summer resident in montane forests throughout Nevada, occupies mid-elevational piñon-juniper woodlands, and is dependent on perennial water sources within these woodlands. This species gleans insects (primarily small moths) over vegetation and open water while foraging. It roosts solitary or in small groups (Colorado Division of Wildlife 1984; Fitzgerald et al. 1994). Roost sites encompass buildings, hollow trees, caves, mines, rocky crevices, and other underground openings. Little is known about this species' use of hibernacula, but caves and mine adits and shafts support wintering bats, in addition to providing habitat for breeding populations. Species' data relative to Nevada also are lacking. The abandoned mine workings located along the eastern portion of the project area may provide potential roost sites for this bat species; however, no individuals were observed during the 1995 field surveys (SWCA 1996c, 1996d).

The fringed myotis is a summer resident in the Great Basin and has been reported in woodlands throughout the state. It occupies habitats ranging between desert scrub communities to higher elevation woodlands. In Nevada, piñon woodland is one of the most commonly used plant communities. This species gleans small insects (mainly moths) from foliage during foraging. Nursery colonies and hibernacula are often located in mines, caves, and buildings. Roosts may be in caves, rock crevices, mines, and buildings. Males typically roost singly (Colorado Division of Wildlife 1984). This species is susceptible to human disturbance, particularly during the breeding season (Arizona Game and Fish Department 1993). Parallel to the long-eared myotis, the fringed myotis was not observed during the field surveys, but potential roost sites could occur within the abandoned shafts and adits that occur in the proposed mine exploration area (SWCA 1996c, 1996d), if the species is present.



Source: SWCA 1996.
Source for Base Map: USGS 1987.

Florida Canyon Mine

Map 3-21

Survey Results for Bat Species and Potential Roost Sites

The long-legged myotis is a summer resident from Great Basin woodlands to montane forests. This species gleans insects above woodlands, over ponds, and along riparian corridors (Colorado Division of Wildlife 1984). Individuals typically day roost singly or in small groups in buildings, rock crevices, and loose tree bark. Night roosts and hibernacula are often in caves and mines (Colorado Division of Wildlife 1984; Warner and Czaplewski 1984). Occurrence data for this species exist approximately 1 mile from the project area (NNHP 1995, 1997). No long-legged myotis were observed during the 1995 field surveys; however, potentially suitable habitat occurs along the eastern portion of the study area (SWCA 1996c, 1996d).

The Townsend's big-eared bat is a year-round resident in Nevada. This species prefers caves, mines, and buildings that maintain stable temperatures and air flow for nursery colonies, bachelor roosts, and hibernacula (Colorado Division of Wildlife 1984). The Townsend's big-eared bat occupies habitats ranging among desert, piñon-juniper, other coniferous forests, broadleaf or deciduous forests, shrublands, and grasslands. This species gleans insects from foliage while foraging and roosts both singly and in colonies (Colorado Division of Wildlife 1984). This bat is highly susceptible to disturbance during hibernation; mortalities may result from as few as one disturbance during this critical period (Fitzgerald et al. 1994).

Two subspecies are known to occur in Nevada, including the Pacific subspecies (*Corynorhinus townsendii townsendii*) and the pale subspecies (*C. t. pallescens*). *C. t. pallescens* was incorrectly omitted from the historical range listed in the USFWS's 1994 Animal Notice of Review and has, therefore, been reported as not occurring in Nevada. This error should be corrected in subsequent Federal Register Notices. Presently, there is a debate as to the validity of any subspecific variation in *Corynorhinus* in the western United States. Genetic studies are currently being conducted. Although no Townsend's big-eared bats were directly observed in the study area during the 1995 surveys, one individual was documented in an abandoned building located at the historic Humboldt City site (SWCA 1996c, 1996d), and sign was recorded in a portion of the Piedmont Mine Complex, indicating this species' presence at least a portion of the year (SWCA 1996d).

The spotted bat is rare throughout the western United States. Although limited data are currently available on this species, the spotted bat is thought to occupy cold deserts and submontane zones, using hibernacula that maintain a constant temperature from September to May rather than migrate (Dalton et al. 1990). It also is believed that this bat forages nocturnally for insects over open water, marshes, and open woodlands, (e.g., piñon-juniper). This species has been reported roosting in horizontal rock crevices in cliffs, along washes, or in rock outcrops (Wai-Ping and Fenton 1989). The upper elevations along the eastern portion of the project area may provide suitable habitat for the spotted bat; however, no individuals were observed during the 1995 field surveys (SWCA 1996c and 1996d). No suitable habitat for this rare bat occurs in the project area (Resource Concepts 1994; BLM 1995).

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

No BLM plant species of Special Concern have been documented for the project area. Therefore, no impacts to sensitive plant species have been identified from the implementation of the Proposed Action.

The impact analysis for sensitive wildlife resources focuses on the species identified in Section 3.8.1, Affected Environment, addressing only the applicable project components for each species discussed. No adverse effects to aquatic species would occur from the proposed project, since no perennial water sources or naturally occurring springs would be impacted by the proposed mine expansion activities, as discussed in Section 3.3, Water Resources and Geochemistry.

No impacts to the peregrine falcon would be anticipated from the proposed project. No active eyries occur near the project area, no riparian habitat that may support falcon prey would be impacted by the proposed mine expansion, and

migrating birds would be infrequent through the project vicinity.

No impacts to wintering or migrating bald eagles would be expected from the mine development. Birds may forage near the Pitt-Taylor and Rye Patch Reservoirs and in the surrounding foothills, but anticipated effects from mine development would not be expected to impact foraging individuals.

No direct impacts to the ferruginous hawk have been identified. Although individuals are known to forage in the project area, no known nest sites have been documented. However, since ferruginous hawks are highly susceptible to disturbance during the courtship and incubation periods, mine expansion activities, particularly mine exploration, that would occur within 0.5 mile of an active nest site could result in indirect effects to breeding birds.

No impacts to the northern goshawk would be anticipated from the proposed project. Although a previously active goshawk nest occurs within 2 miles of the project area, no direct or indirect impacts to breeding individuals would be anticipated, particularly since no impacts to surface water availability or associated riparian vegetation would occur from implementation of the proposed project. In addition, the vegetation in the project area is neither appropriate for goshawk nesting nor is it optimal for species' foraging.

Burrowing owls could occur in the project area. Although no occupied burrows or owl sign were recorded during the 1995 field surveys (SWCA 1996c), the shrubland vegetation that would be disturbed by the proposed project is suitable for supporting breeding and foraging birds. Owls would typically occupy the more open areas with good visibility. Removal of a maximum of 860 acres of the native, undisturbed habitats could directly affect the burrowing owl, if present. Surface disturbance would result in the loss of potential nesting habitat, and if the disturbance occurred during the breeding season, direct mortalities could occur to incubating adults or young owlets in the nest burrows. This habitat loss would be short-term (i.e., life of the mine) due to the relatively abundant shrubland habitats in the vicinity of the proposed project and no burrowing owl concentrations are known to occur in the mine area. Burrowing owls could inhabit the project area following mine reclamation (i.e., long-term).

No adverse impacts to the pygmy rabbit would likely occur, due to the lack of suitable habitat within the project area.

Of the sensitive bat species identified for the proposed project, both the small-footed myotis and the Townsend's big-eared bat have been documented as occurring in the project area (SWCA 1996d). Based on available habitat, other bat species also may occur. The proposed expansion activities in the immediate mine area would not directly impact existing shafts and adits that may support roosting bats, since no workings occur within the proposed disturbance areas. However, the planned exploration activities associated with the proposed project may directly or indirectly affect some of the historical underground workings, based on the location of these features relative to exploration routes, as shown in Map 3-21.

If mine exploration directly intersects an underground feature, roosting bats could be disturbed by the drilling procedures, possibly impacting bat hibernacula, maternity roosts, or bachelor roosts. Drilling could adversely impact bats three ways: 1) noise and vibrations could disturb roosting bats, 2) vibrations could compromise the integrity of the underground features, and 3) shifting of the underground structures could interrupt the air flow critical to hibernacula, if present. Potential impacts would be more likely to occur in the Piedmont Mining Complex, based on the study results recorded during the 1995 summer surveys (SWCA 1996d).

In the event that exploration activities resulted in increased noise or vibrations, impacts to bats would vary, depending on proximity to mine exploration, the season, extent of the disturbance, and species affected. If hibernating bats were disturbed, bat mortalities could result from the expenditure of their energy reserves necessary to survive the winter. The Townsend's big-eared bat is particularly sensitive to disturbances at their roost sites (Fitzgerald et al. 1994). This species'

population decline in the western United States has been primarily attributed to loss of roost habitat and may readily abandon a roost site, if disturbed. Air flow into hibernacula is often critical to bat survival, since this maintains the optimal environment for hibernating bats. If drilling vibrations were to interrupt air flow in roosting colonies, bat mortality or abandonment may result. Therefore, based on existing data, winter hibernacula and day roost sites may be adversely affected by the proposed mine exploration activities in the historic Piedmont Mine Complex. Loss of hibernacula from mine exploration, whether it would be from disturbance, habitat loss, or indirect mortalities would be considered an adverse impact to the local bat population.

3.8.2.2 North Extension of the Heap Leach Pad Alternative

Overall impacts to sensitive species from implementation of the North Extension of the Heap Leach Pad Alternative would parallel those described for the proposed project. No impacts to sensitive plants would occur, since none have been observed or documented for the project area. Habitat disturbance for sensitive wildlife species under this alternative would be 143 acres less than for the proposed project, resulting in potential habitat loss for the burrowing owl, if present. Potential impacts to ferruginous hawks and sensitive bat species from proposed exploration activities would be the same as those identified for the proposed project.

3.8.2.3 No Action Alternative

Under the No Action Alternative, potential impacts to nesting ferruginous hawks and potential habitat loss for the burrowing owl would not occur. Also, potential impacts to roosting bats from noise, decreased air flow into hibernacula, or loss of roost site integrity from expanded exploration activities would not occur.

3.8.3 Cumulative Impacts

Suitable habitat for five special status species including the Bruneau River prickly phlox, windloving buckwheat, Nevada oryctes, Nevada dune beardtongue, and obscure scorpion plant occurs within the cumulative assessment area. Based on surveys completed for these species in the project area, no populations have been observed in the project area (SWCA 1996b; Western Resource Development Corporation 1985). Therefore, no cumulative effects to the special status species are anticipated.

The cumulative assessment area for special status species is the same as that identified for general wildlife species in Section 3.7.3, Cumulative Impacts. No direct cumulative impacts were identified for the special status species identified for the project. The burrowing owl would be cumulatively affected by the past, present, and reasonably foreseeable future actions, based on overall habitat loss. However, it is impossible to quantify these impacts, since this species occurs sporadically throughout the region.

Other species that have likely been cumulatively affected by historic and ongoing mining activities would include nesting raptors. As the mine activities have expanded along the west flank of the Humboldt Range, breeding birds have moved farther from human disturbances, resulting in displacement and overall habitat fragmentation.

The presence of historic mining has likely improved the habitat for roosting bats. As the natural habitats have decreased for these sensitive bat species throughout the western United States, bats have relocated into abandoned underground workings, using them for roost sites. Potential cumulative impacts to bats would primarily involve additional exploration activities that may result in disturbance to roost sites either through direct impacts from noise, vibrations, and human presence or through indirect effects from future mining development.

3.8.4 Potential Mitigation and Monitoring

Issue: Disturbance to breeding ferruginous hawks within 0.5 mile of the proposed development areas.

Measure 1: This measure would parallel Measure 2 in Section 3.7.4, Potential Mitigation and Monitoring, for general raptor species. If project construction would occur during the raptor nesting season (i.e., March 1 through June 15), a survey would be conducted within appropriate habitats prior to disturbance to determine if any breeding raptors or active nest sites occurred within 0.5 mile of the proposed disturbance areas. Appropriate habitat for ferruginous hawks would include areas with juniper trees, cliff faces, and rock outcrops. If a ferruginous hawk occupied territory or active nest were located, the BLM and NDOW would be contacted, and the appropriate mitigation measures would be developed with the agencies to avoid disturbing breeding birds, as discussed for general raptor species.

Effectiveness: Surveys for breeding ferruginous hawks would identify sensitive nest areas that could be disturbed by mining activities. Additional protection measures, if necessary, would minimize the potential short- and long-term impacts to nesting birds.

Application: This measure would apply to the Proposed Action and the North Extension of the Heap Leach Pad Alternative, except for the No Action Alternative.

Issue: Indirect effects to bat hibernacula, nursery colonies, or other roosting concentrations due to mine development.

Measure 2: FCMI's exploration activities would avoid the potential bat hibernacula and day roosts (i.e., sites 8, 11, and 12 - SWCA 1996d) located within the historic Piedmont Mine Complex during exploration activities. FCMI's mine exploration also would avoid impacting any open water resources located within the Florida Canyon drainage. If these underground workings cannot be avoided, or if exploration drilling occurs within 250 feet of an existing shaft or adit, including associated mine drifts and stopes, FCMI would coordinate with the BLM, the NDOW, and Great Basin bat experts (if necessary) to identify adequate protection measures for potential roosting colonies. Applicable protection measures could encompass: 1) additional bat surveys to determine potential communal roost sites, 2) exclusion of bats from specific workings, and/or 3) habitat enhancement at other shafts or adits (e.g., bat gate installation) in proximity to a communal roost site that would be disturbed by mine exploration activities. The development and implementation of these measures would typically depend on the types of activities planned, the proximity of the disturbance to the shaft or adit, the relative habitat quality and extent of a roost site, and the season of proposed disturbance.

Effectiveness: Minimizing the amount of disturbance to communal bat roosts that would be disturbed from mine exploration activities would prevent adverse impacts to resident bat populations during sensitive periods. Identifying protection measures or habitat enhancement measures would ensure the long-term protection of the roost sites for local bat populations. Coordinating with agency officials regarding bat exclusions, habitat protection, or enhancement measures would prevent significant impacts to bat concentrations that may be affected by mine development.

Application: This measure would apply to the Proposed Action and the North Extension of the Heap Leach Pad Alternative, except for the No Action Alternative.

3.8.5 Residual Adverse Impacts

No residual impacts would occur to Federally listed species identified for this project. Residual effects applicable to BLM Species of Special Concern would be limited to potential habitat loss for the burrowing owl.

3.9 Range Resources

3.9.1 Affected Environment

The project area is open to livestock grazing and is located entirely within the Humboldt House grazing allotment. This allotment is bounded by the Rye Patch allotment to the south, the Majuba allotment to the west, the Humboldt Valley allotment to the northeast, and the Prince Royal and Star Peak allotments to the east. The Humboldt House allotment contains approximately 23,837 acres of public land and 22,665 acres of private land for a total of 46,502 acres. The allotment is approximately 7 miles wide extending east to west and 13 miles long extending north to south. The Humboldt House allotment is classified as a "C" (custodial) category allotment. A "C" classification is given to allotments where: 1) vegetation has stabilized, 2) vegetative production is low and potential for improved productivity is limited by economic criteria, 3) resource conflicts are limited or cannot be controlled due to land ownership patterns, and 4) there is no present likelihood of positive economic return on public investment.

The Humboldt House allotment is comprised of two use areas; these use areas are divided by a fence located along the Southern Pacific Railroad ROW which runs parallel to I-80 (Map 3-22). The allotment is currently leased by three permittees and is managed for an active grazing preference of 728 animal unit months (AUMs). In the east use area, where the entire existing mine operations and project expansion occur, a total of 508 AUMs are allocated for BLM-administered lands. The east use area currently includes 2 permittees. One sheep operator currently has a permit to utilize 106 AUMs. Sheep grazing typically occurs for 2 weeks in late winter in the uplands located east of the project area. The second operator holds a permit for cattle grazing in the east use area from May 1 through September 30 (203 AUMs) and from November 1 through March 31 (199 AUMs). In the west use area, the operator holds a permit for cattle grazing (402 AUMs) from October 15 to January 15.

The average stocking rate for the entire allotment is 25 acres per AUMs. There are two prominent range sites within the project area. Shallow calcareous loam sites occur in the uplands, with 8 to 10 inches average precipitation per year. Dominant vegetation on these sites includes black sagebrush, Thurber needlegrass, and Indian ricegrass. The average annual forage production is 350 pounds per acre per year. The other range site, occurring at lower elevations, is the loamy range site with precipitation averaging from 5 to 8 inches per year. Dominant vegetation in this area includes shadscale, bud sagebrush, bottlebrush squirreltail, and Indian ricegrass with an average annual production of 450 pounds per acre per year.

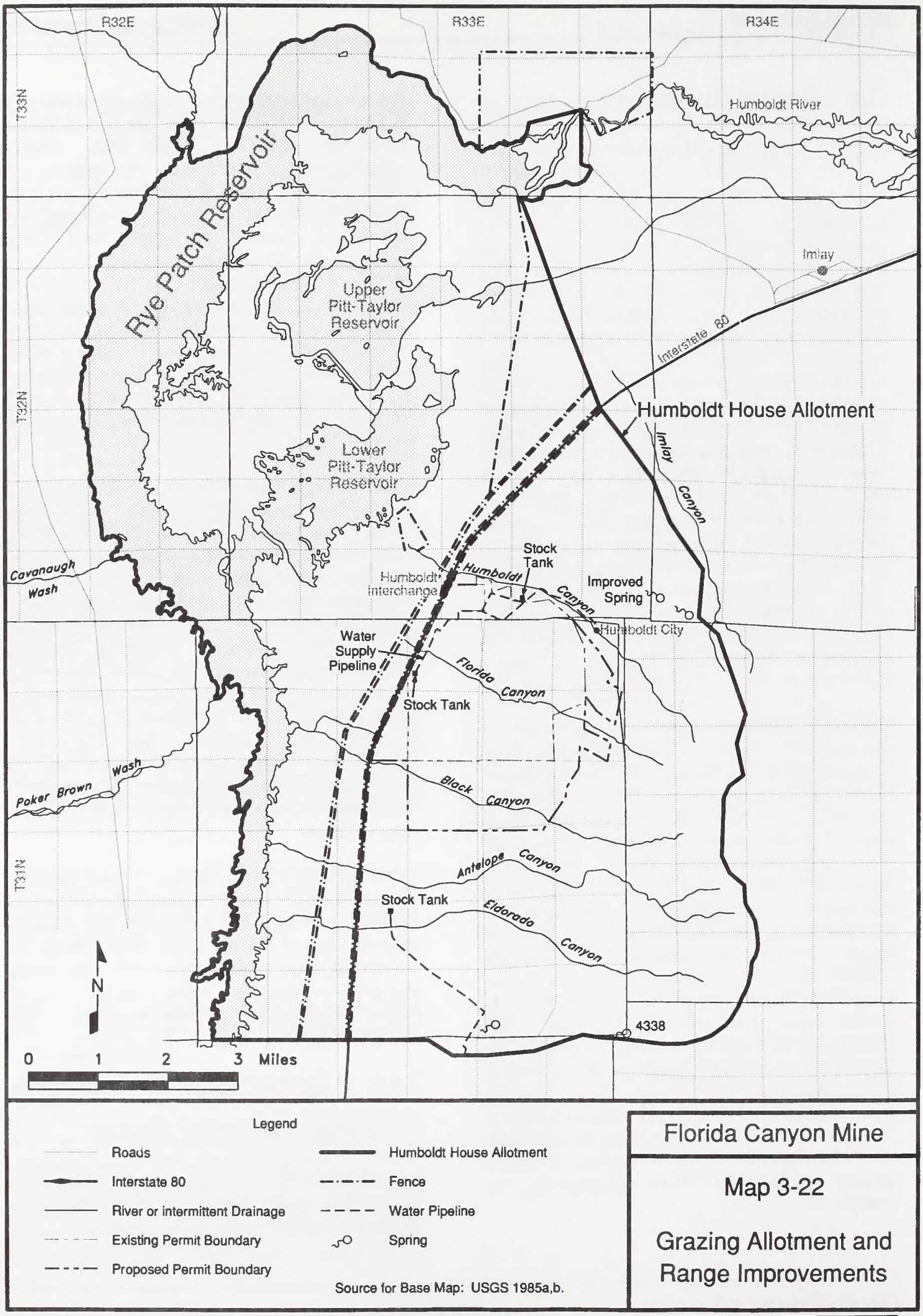
Existing range improvements in the project area include two stock watering tanks and a range fence. One stock tank is located immediately north of the existing mine and the other is located southwest of the existing heap leach pad. Water is pumped from a spring in Humboldt Canyon and transported to the tanks through an aboveground pipeline. FCMI is currently responsible for maintenance of the pipeline. The existing range fence encompasses approximately 1,500 acres of the existing mine disturbance on the north, west, and south sides. The eastern side of the existing permit boundary are not fenced because the steep slopes are considered inaccessible to domestic livestock and provide a natural barrier.

Existing range improvements in the Humboldt House allotment located outside of the existing mine area include a stock pond with pipeline approximately 1.5 miles south of the proposed permit boundary (Map 3-22). In the west range use area, a corral is located near the railroad tracks approximately 0.5 mile northwest of the project area.

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action

Upon development and operation of the Proposed Action, the range perimeter fence would be expanded to encompass approximately



Florida Canyon Mine

Map 3-22

Grazing Allotment and Range Improvements

2,600 total acres for mine expansion. Therefore, an additional 1,100 acres of vegetation would be temporarily unavailable for livestock grazing during mine development and operation. The exclusion of livestock from 1,100 acres of rangeland forage would result in the temporary loss of 44 AUMs, which would reduce the active grazing preference within the Humboldt House allotment to 906 AUMs for the life of the project. The loss of 44 AUMs represents less than 5 percent of the active grazing preference. A permanent loss of 19 acres of rangeland or 1 AUM would result from pit expansion associated with the Proposed Action and the construction of a fence along the pit perimeter after mine closure and reclamation.

With implementation of the Proposed Action, both of the existing stock water tanks within the proposed permit boundary would be moved outside of the proposed range perimeter fence. The north and south stock tanks would be moved approximately 2,000 feet to the northeast and 1,000 feet to the west of their present locations, respectively.

3.9.2.2 North Extension of the Heap Leach Pad Alternative

For this Alternative, the existing stock tanks would move to the same locations as for the Proposed Action. The proposed perimeter fence area for this Alternative would encompass the same additional acreage (1,100 acres) as for the Proposed Action. The temporary and permanent loss of AUMs would be the same as described for the Proposed Action.

3.9.2.3 No Action Alternative

Under the No Action Alternative, additional impacts to range resources would not occur from development and operation of the Proposed Action. Presently permitted mine and mineral exploration projects associated with the Florida Canyon Mine resulted in the exclusion of 1,500 acres of rangeland. This exclusion has resulted in the temporary loss of 60 AUMs, based on a average stocking rate of 25 acres per AUMs.

3.9.3 Cumulative Impacts

The cumulative assessment area for range resources is the entire 46,502-acre Humboldt House grazing allotment (Map 3-19). Past disturbances within the Humboldt House grazing allotment include approximately 67 acres of rangeland disturbed during previous mining and other development activities (i.e., Rye Patch Geothermal Project; Mineral Associates, Inc. Project; and miscellaneous mining activities). Present disturbances within the cumulative assessment area include 1,259 acres of vegetation. Mine development and operation activities associated with the proposed project would result in the disturbance or removal of 860 acres of vegetation. Therefore, a total of 2,186 acres of vegetation would be disturbed or removed by past, present, and proposed activities.

Approximately 50 acres of the 67 acres of past disturbance has been naturally revegetated providing forage for grazing livestock. Seventeen acres of past disturbance have not been naturally revegetated, which has resulted in the permanent loss of 1 AUM on private lands. After mine closure and reclamation of present and proposed disturbances, approximately 315 acres of disturbed and reclaimed land within the pit would be permanently excluded from livestock grazing. The exclusion of livestock from this area would result in the permanent loss of 13 AUMs. Therefore, disturbances and removal of vegetation, in addition to the exclusion of rangeland from grazing, would result in the cumulative permanent loss of 14 AUMs from the Humboldt House grazing allotment.

3.9.4 Potential Mitigation and Monitoring

No mitigation measures for range resources are recommended.

3.9.5 Residual Adverse Impacts

Residual impacts of the Proposed Action for range resources would include the permanent loss of 1 AUM. This total represents less than 1 percent of the total AUMs for the Humboldt House allotment.

Following post-mining reclamation, approximately 13 AUMs would be permanently lost.

3.10 Land Use and Access

3.10.1 Affected Environment

3.10.1.1 Land Use Authorizations

Lands administered by the BLM comprise the majority of public lands in Pershing County and account for approximately 75 percent of the county's land base (State of Nevada 1996). Private lands in Pershing County generally are interspersed with public lands in a checkerboard pattern for a distance of 20 to 25 miles on either side of the Humboldt River. This land ownership pattern resulted from Congress deeding alternate sections of land (each section being 1 square mile) to the Central Pacific Railroad Company, which constructed the Trans-Continental Railroad through Nevada in the late 1860s. Surface ownership in the project area is shown in Map 2-1.

Public lands under BLM jurisdiction are managed for the multiple uses of range, forestry, watershed, mineral extraction, recreation, wilderness, and wildlife habitat. The project area is located within the BLM's Winnemucca District. The BLM's Sonoma-Gerlach Management Framework Plan (BLM 1982) recognizes that the project area contains a variety of metallic and industrial mineral deposits, many of which are considered economically significant. One of the objectives found in the plan is to make public lands and Federally owned minerals available for exploration and development of mineral and material commodities. The Plan also prohibits withdrawals that would restrict mineral entry within portions of the project area (T31N, R33E, Sections 1, 2, and 12) that are known to contain strategic, critical, and economically important minerals.

Private lands within the project area are zoned by Pershing County as being within an Agriculture-Mining-Housing Land Use District. Mineral extraction is recognized as an accepted use within this land classification. Mining and agricultural uses, and housing needed in conjunction with these pursuits, are permitted within this zoning district and must comply with Chapter 17.20 of the *Pershing County Zoning Ordinance* (1995).

Land use within the project area primarily consists of mineral exploration and development, livestock grazing, and dispersed recreational use. The project area lies within the Imlay Mining District. FCMI has operated the Florida Canyon Mine since 1986. Historical mining in the area dates back to the 1860s, and numerous prospects, shafts, and adits exist within the area. The existing permit boundary encompasses approximately 3,157 acres of public and private lands, of which 1,513 acres are managed by the BLM. Private lands within the project area have been used primarily for mineral exploration and development on patented mining claims. The project area is located within the 46,502-acre Humboldt House Grazing Allotment that includes both private and public lands. See Section 3.9, Range Resources, for a discussion of livestock grazing. Section 3.11, Recreation, contains a discussion of dispersed recreational use in the project area.

There are no residential areas within the project area. The nearest residences are located within the Humboldt Trailer Court and a small farm (Humboldt House), located approximately 1 mile north of the current mine site (SWCA 1996b). The Humboldt Trailer Court was established in 1985 in direct response to mining activities conducted by FCMI. Approximately 35 people reside within the 15 developed lots, occupying 3.9 acres of private land owned by Humboldt Trailer Court, Inc. (Dodds 1996). Residences at this location will be relocated by FCMI to a more distant location prior to implementation of the proposed expansion.

The historic Humboldt City site lies adjacent to the project area's northeast boundary in Humboldt Canyon. Features within the canyon include a cemetery, hundreds of building foundations, and various mine prospects.

3.10.1.2 Rights-of-Way

I-80 lies to the west of the project area. Several borrow and gravel pits associated with construction of the Interstate lie within and near the project area. A 120-kilovolt (kV) transmission line (with a 60-kV underbuild) passes through the project area and roughly parallels the Interstate. A buried natural gas pipeline parallels I-80 to the west. A compressor station associated with this pipeline is located about 0.5 mile west of the

project area. Other ROWs near the project area include telephone fiber optic lines, radio and microwave substations, and a water supply line from Pitt-Taylor Reservoir that serves the mine site. A radio facility and microwave towers are located on a prominent ridge high above the Florida Canyon Mine. Map 3-23 depicts existing ROWs in and near the project area and Table 3-20 provides additional information on the ROWs.

3.10.1.3 Access

Access to the project area is provided via I-80 and a paved, two-lane frontage road. A security gate at the entrance to the mine prevents unauthorized public access to the mine site. I-80 is the primary east-west highway in Nevada and connects Winnemucca, and destinations further east, with Reno and destinations further west. The frontage road that provides access to the mine site also provides access to relatively unimproved roads that lead up both Johnson and Black Canyons. The communication facility located above the Florida Canyon Mine is accessible via another road that traverses the ridge south of Humboldt Canyon. Through an agreement with Nevada Bell, FCMI maintains this road.

Traffic volumes on I-80 near the Humboldt Interchange average 6,610 vehicles per day (Nevada Department of Transportation 1996). No data exists for traffic volumes on the frontage road that provides access to the Florida Canyon Mine.

The Southern Pacific and Union Pacific railroads, which roughly parallel I-80 west of the project area, provides freight service to Winnemucca, Elko, and Reno. AMTRAK passenger service also is provided at these stops.

3.10.2 Environmental Consequences

The Proposed Action or the other project Alternative could affect land use and access both directly and indirectly. Direct effects may include the termination or modification of existing authorized land uses, ROWs, or access routes in the project area. Indirect impacts may occur as a result of altered access to areas adjacent to or within proximity to the mine site. Indirect effects also would result if the Proposed Action or selected alternative stimulated or encouraged the development of land uses not presently anticipated, or conversely, precluded other planned or proposed uses.

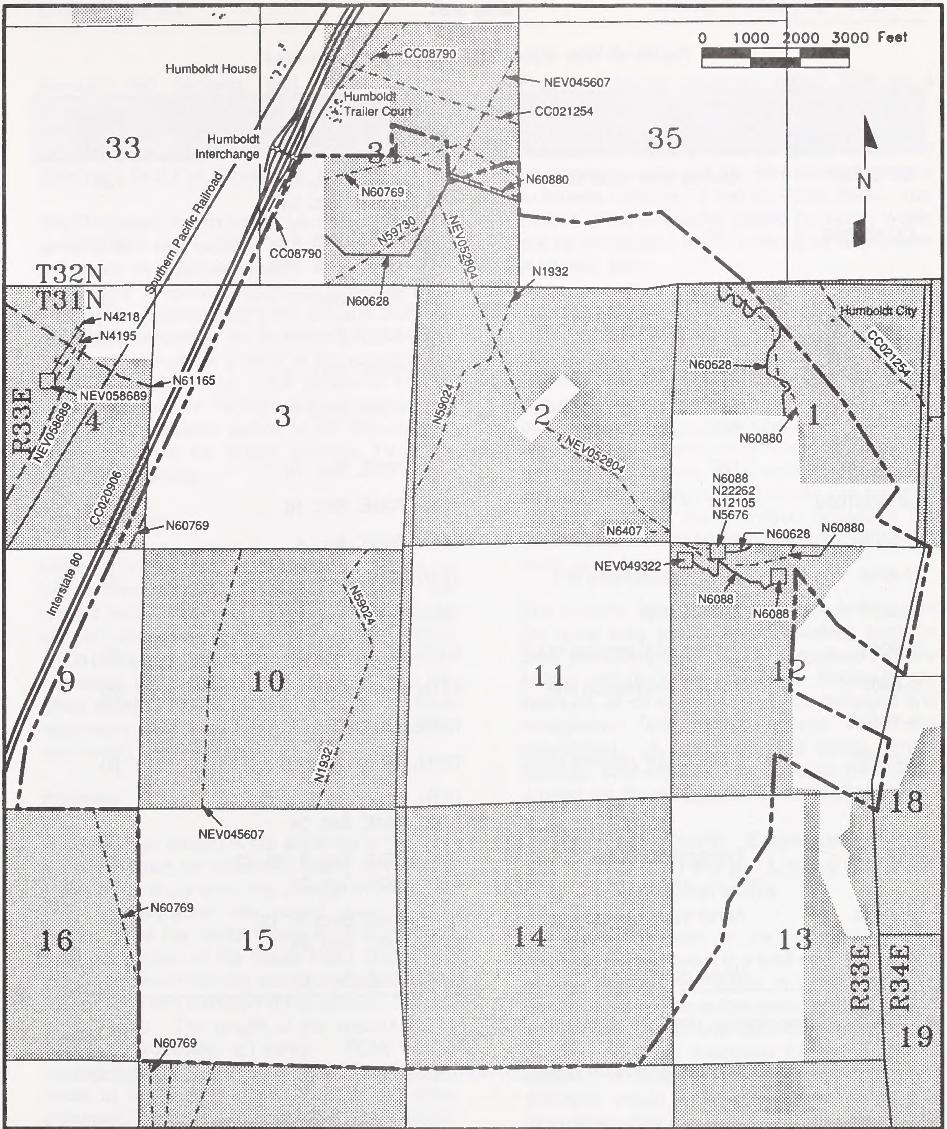
3.10.2.1 Proposed Action

Land Use

The Proposed Action would occur on both public and private lands. As currently planned, total new disturbance would be approximately 447 acres on public land and 413 acres on private land, resulting in a total project disturbance of approximately 860 acres (Table 2-1). Expansion of the pit, waste rock dumps, and construction of the new heap leach facility would require use of public lands administered by the BLM. The Proposed Action is consistent with plans and policies of the BLM that recognize the importance of mineral exploration and development within the project area. Proposed mining activities on private lands would be consistent with the Pershing County Zoning Ordinance. The proposed project, therefore, would not conflict with adopted plans and policies of government entities that regulate land use.

It is not known at this time whether FCMI intends to submit an application for a mining patent of public lands affected by the proposed project. If a mining patent were issued, ownership of affected BLM-administered parcels would be transferred to FCMI with accompanying surface and subsurface development rights. Congress has ordered a temporary moratorium on the approval of all public land patents, while it considers legislation to reform issuance of Federal land patents.

Public use of the existing mine area is currently prohibited. The Proposed Action also would preclude any public use of the expanded mine area for the life of the mine. For both safety and security reasons, public access to the active mining and processing areas would be precluded to the maximum extent permitted by law during the life of mining. The area of operations would be fenced, as described in Section 2.2.10,



Florida Canyon Mine

Map 3-23

Existing Rights-of-Way in the Project

Table 3-20

Rights-of-Way Within and Near the Project Area

Serial Number	Type of Land Use	Location	Width (feet)
CC-08790	Buried fiber optic cable	T31N, R33E, Sec. 4 T32N, R33E, Sec. 34	20
CC-020906	I-80	T31N, R33E, Sec. 4 T32N, R33E, Sec. 34	400
CC-021254	Pipeline	T31N, R33E, Sec. 1	50
NEV-045607	Aerial powerline	T32N, R33E, Sec. 34	100
NEV-049322	Comm. site[1]/access road	T31N, R33E, Sec. 12	50
NEV-058689	Natural gas pipeline and compressor station	T31N, R33E, Sec. 4	50
NEV-056199	I-80	T31N, R33E, Sec. 16	
NEV-051028	I-80	T31N, R33E, Sec. 16	400
N-4195	Aerial transmission line	T31N, R33E, Sec. 4	25
N-4218	Comm./telephone line	T31N, R33E, Sec. 4	20
N-5676	Comm. site[1]	T31N, R33E, Sec. 12	
N-6088	Comm. site[1]/access road	T31N, R33E, Sec. 12	50
N-6407	Aerial transmission line	T31N, R33E, Sec. 2	25
N-12105	Comm. site[1]	T31N, R33E, Sec. 12	
N-22262	Comm. site[1]/access road	T31N, R33E, Sec. 12	20
N-60628[2]	Access road	T31N, R33E, Secs. 1, 12 T32N, R33E, Sec. 34	50
N-60769	Transmission Line	T31N, R33E, Sec. 4, 16, 22 T32N, R33E, Sec. 34	90
N-60880	Aerial transmission line	T31N, R33E, Secs. 1, 12 T32N, R33E, Sec. 34	50
N-61165	Water pipeline	T31N, R33E, Sec. 4	25

[1]ROWs for communication sites are 100 feet x 100 feet.

[2]Would require modification or relocation under the North Extension of the Heap Leach Pad Alternative.

Security and Fencing, and would not be accessible to the general public. Consequently, dispersed recreational use of lands within the proposed project area would be prohibited (Section 3.11.2.1 of Recreation).

The Proposed Action would be compatible with existing land use patterns and, therefore, would not result in adverse impacts to existing land uses. The proposed expansion would exclude grazing on approximately 1,100 acres of currently available rangeland in the Humboldt House Grazing Allotment as a result of the construction of the perimeter fence. The projected loss of animal unit months during mine operations and after the reclamation period is not expected to adversely affect the lessee (Section 3.9.2.1 of Range Resources).

<u>Rights-of-Way</u>

Mine expansion has the potential to change or modify administrative land use ROWs within the project area. However, all ROWs necessary to support operations at the Florida Canyon Mine are in place and current (Map 3-23). Construction necessary under the Proposed Action would not affect existing ROWs in the project area. Mine expansion also would not affect major ROW easements, such as I-80.

<u>Access</u>

The proposed project is not expected to have an adverse impact on access to public and private lands in the study area. No change in access to the communication site would occur. The expansion of the South Waste Rock Dump and the construction of the South Heap Leach Pad and the Johnson Canyon diversion channel would require rerouting a portion of the Johnson Canyon access road. The length of the reroute would total approximately 2.1 miles. FCMI would construct the new road on private and public lands to the south of these facilities to allow continued public access into Johnson Canyon. Blading of the new road would occur prior to mine expansion (during which time access could continue to be provided on the existing road) in order to allow uninterrupted public access. Authorization for the access road reroute on public lands would be part of the overall Proposed Action approval, rather than as a separate ROW.

Access to Black Canyon would not be affected by proposed expansion of the mine permit boundary to include Sections 14 and 15, T31N, R33E. This portion of the expanded permit boundary would not be fenced and would continue to be available for public use.

Average daily traffic volumes on local roadways, including I-80, are not expected to change significantly from current levels as a result of the proposed project. This is because the proposed project represents an extension of the life of the mine, with no new operations employees (and associated daily commuting trips to the mine site) anticipated. However, short-term traffic increases would occur during the 12-month construction period. Further, the proposed project is not expected to result in a significant increase in truck traffic to or from the mine.

The closure, abandonment, and reclamation of the mine area would return disturbed lands to their premining land use as rangeland, wildlife habitat, and dispersed recreation. Except for the open pit, all other areas would be reshaped and revegetated, and public access would be established. A combination of safety berms, fencing, and warning signs would be placed around the the pit to prevent public access.

3.10.2.2 North Extension of the Heap Leach Pad Alternative

The North Extension of the Heap Leach Pad Alternative would result in a total new disturbance of approximately 717 acres, of which 390 acres would be located on public lands. Impacts of this alternative to land use and access would be identical to those described for the Proposed Action. A single ROW for an access road (N60628) would require relocation under this alternative. Any modifications of existing ROWs associated with this alternative would require the approval of both the BLM and the utility owner.

The North Extension of the Heap Leach Pad Alternative would result in the removal of

approximately 1,100 acres of currently available rangeland in the Humboldt House Grazing Allotment. Impacts to the lessee from the projected loss in AUMs is described in Section 3.9.2.2 of Range Resources.

3.10.2.3 No Action Alternative

Under the No Action Alternative, additional disturbance to lands within the project area would not occur. Access to undeveloped portions of the project area would be preserved, and the existing land uses would be maintained, including grazing on the Humboldt House Allotment.

3.10.3 Cumulative Impacts

Cumulative impacts to livestock grazing are discussed in Section 3.9.3, Cumulative Impacts for Range Resources, and cumulative impacts to recreational resources are described in Section 3.11.3, Cumulative Impacts for Recreation. No impacts to land use and access were identified as a result of the Proposed Action. Consequently, the Proposed Action would not contribute to cumulative land use and access effects.

3.10.4 Potential Mitigation and Monitoring

No land use or access impacts would require monitoring or mitigation measures.

3.10.5 Residual Adverse Impacts

Residual impacts to land use relate primarily to the success of the reclamation efforts. If, upon project completion, the affected land area were reclaimed such that former land uses could be reinstated, residual adverse effects would be minimal. However, if reclamation were unsuccessful, residual land use effects could occur.

3.11 Recreation

3.11.1 Affected Environment

No developed recreational facilities exist within proximity to the project area. Rye Patch Reservoir and the lower and upper Pitt Taylor reservoirs are located 2 to 3 miles to the northwest and offer water sport opportunities such as canoeing, boating, water skiing, swimming, and fishing. Boat launching, picnicking, and camping facilities are provided near Rye Patch Dam, located approximately 6 miles south-southwest of the project area and accessible via the Rye Patch Dam exit off I-80.

Rye Patch Reservoir is managed by the state parks system and receives heavy use during spring and summer weekends and holidays. The Humboldt River/Rye Patch Reservoir is considered a significant warm water/cool water fishery by the NDOW. Sport fish within the Humboldt River include walleye, white bass, largemouth and smallmouth bass, white crappie, and channel catfish. Angler use days average approximately 20,000 to 25,000 at Rye Patch Reservoir (French 1996).

Dispersed outdoor recreation is the predominant type of recreation in the Winnemucca District. The BLM does not maintain current recreational use data for the pubic lands in the study area. Recreational use within the proposed expanded permit boundary is limited and includes off-road vehicle use, hunting, and rockhounding. Dispersed recreational activities that occur in the mine vicinity include hunting, hiking, and cave exploration in the Humboldt Range and off-road sightseeing, rockhounding, and mountain biking at lower elevations.

Limited hunting occurs on the western flank of the Humboldt Range. The only big game species in the vicinity of the project area is mule deer. Other game species such as chukar, California quail, and mourning dove occur throughout the area as well. The upper elevations of the Humboldt Range are considered sage grouse range. Hunter use days associated with the Humboldt Range have been estimated at an average of 400 to 500 (Benolkin 1996).

Hunting for big game is regulated through a quota system established by the NDOW. The quota system is oversubscribed each year for deer tags because demand far exceeds supply.

Humboldt and Black Canyons are the only areas in the project vicinity where dispersed recreational activities occur. Historic Humboldt City, established in the 1860s, is located in Humboldt Canyon. An easily accessible road leads to the old town site; the road then becomes a narrow jeep trail that leads to numerous abandoned mines. An established road to Black Canyon in the southeastern portion of the project area leads to a natural arch and the Valerie Fluorspar mines, which are located outside of the project area (SWCA 1996b).

No designated wilderness areas exist within 60 miles of the project area. The closest Wilderness Study Areas (WSAs) are the Jackson Mountain/Black Rock Desert WSAs, located approximately 35 miles northwest of the project area.

3.11.2 Environmental Consequences

3.11.2.1 Proposed Action

No parks, concentrated recreational use areas, designated wilderness areas, WSAs, or special recreation management areas would be directly impacted by the proposed expansion. The proposed expansion would withdraw additional lands previously available for dispersed recreationists during the construction, operation, and reclamation activities. Recreational activities, such as hunting and hobby rock collecting, would be prohibited within the mine site during the life of the project. Off-highway vehicle use would continue to be restricted at the mine site. Overall, the displacement of dispersed recreationists would be a minimal adverse impact since existing recreational use in the project area is extremely light and the area has other abundant public, open-space lands available for dispersed recreational opportunities. Public access would not be restricted on public roads near the mine site. Although no specific recreational use data for public lands directly affected by the proposed project are available, the number of dispersed

recreationists affected is expected to be minimal, and their displacement would not create overuse of other areas or degradation of the resource.

Hunting opportunities at Rye Patch Reservoir would not be affected by the proposed expansion. Impacts to mule deer populations within the project vicinity are expected to be minimal to moderate with the proposed expansion, while impacts to the availability of upland game species from increased hunting in the region is expected to be minimal (Section 3.7, Wildlife and Fisheries Resources). Consequently, some reduction to hunting opportunities in the project vicinity is expected. Given the diversity of public lands available locally for hunting, this impact would not be considered adverse.

The proposed expansion is not expected to affect access to either Humboldt or Black Canyons. Existing access routes would remain open, even though the expanded permit boundary would encompass the road leading to Black Canyon. As described in Section 3.10.2.1 of Land Use and Access, access to Johnson Canyon would be modified from construction of mine-related facilities; however, FCMI would reroute the access road to provide continued public access prior to removing the existing road alignment.

Developed recreational facilities within the region, such as Rye Patch Reservoir, are not expected to be adversely impacted by an influx in the construction work force required to construct the leach pad. This is because developed recreational facilities in the region have the capacity to absorb the extra demand that could be placed on them, as a result of the temporary construction work force. Furthermore, FCMI does not anticipate an increase in the permanent mine work force, as a result of proposed mine expansion.

The closure, abandonment, and reclamation of the mine area would return public lands to their premining land use as rangeland, wildlife habitat, and dispersed recreation. Except for the mine pit, all other facilities would be revegetated and made available for public access. Thus, the potential exists for hunting opportunities on the mine site following mine closure and reclamation.

3.11.2.2 North Extension of the Heap Leach Pad Alternative

This alternative would generate impacts to recreational resources identical to those described for the Proposed Action.

3.11.2.3 No Action Alternative

Under the No Action Alternative, disturbance associated with the proposed project would not occur and existing dispersed recreational opportunities on the project site (hunting and off-road vehicle use) would continue to be available.

3.11.3 Cumulative Impacts

The area of analysis for cumulative effects to recreation includes the entire Humboldt Range and surrounding valleys. Past disturbance and present actions, such as the Coeur Rochester Mine and the Rye Patch Geothermal Project, have resulted incrementally in the loss of public lands available for dispersed recreational activities and have generated, through an increase in the local population, a growing demand for dispersed and developed recreational opportunities. Cumulative development has adversely impacted both small and big game populations as a result of habitat displacement as well as additional road construction and the associated increased public access, which is considered beneficial to hunting opportunities. Increased recreational demands at Rye Patch Reservoir would occur, as a result of the construction and operations work force associated with cumulative projects in the region. However, the facilities at the reservoir could accommodate this anticipated increase in demand and levels of use. Overall, cumulative impacts to game populations and fisheries in the Humboldt River/Rye Patch Reservoir are described in Section 3.7.3 of Wildlife and Fisheries Resources. In summary, the overall cumulative impact to recreational resources from past, present, and reasonably foreseeable future actions would be considered minimal because abundant public open space lands would remain available for dispersed recreational opportunities.

3.11.4 Potential Mitigation and Monitoring

Since no adverse impacts to recreational resources have been identified for the Proposed Action or the Alternatives, no mitigation or monitoring is recommended.

3.11.5 Residual Adverse Impacts

No residual adverse impacts are expected to result from implementation of the Proposed Action or the Alternatives.

3.12 Aesthetics (Visual Resources and Noise)

3.12.1 Affected Environment

3.12.1.1 Visual

The objectives of the visual resources investigation are to identify and describe important visual resources that could be affected by the proposed expansion and related facilities. Important visual resources are defined for this study as key observation points (KOPs) where the maintenance of the surrounding visual environment is important to people's enjoyment of an area. Visual resources include landscapes in which viewers may travel, use for recreation, or reside in where existing views may potentially be affected by the proposed expansion or ancillary facilities.

The study area is visible over an approximate 4-mile corridor along I-80. Maximum visibility of the study area and the existing mine occurs at the Humboldt Interchange and at the Humboldt Trailer Court, located approximately 0.6 mile north of the existing mine. The study area also is visible from Pitt-Taylor Dam and the southern end of Rye Patch Reservoir. Pitt-Taylor Dam is located approximately 2.5 miles west of the mine site and the southern end of Rye Patch Reservoir occurs approximately 6 miles southwest of the mine.

The BLM initiated visual resource management (VRM) to manage the quality of the landscape by minimizing impacts to visual resources resulting from development activities, while maintaining the effectiveness of all BLM resource programs. In determining VRM class designations, the inventory process considers the scenic value of the landscape, viewer sensitivity to the scenery, and the distance of the viewer to the subject landscape. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual quality of the region (BLM 1986). Management classes are broken down into four levels (Classes I to IV), with Class I designated as most protective of the visual resources. The objectives of these classes vary from very limited management activity to activity that allows major landscape modifications (Table 3-21).

The project area lies entirely within a Class II visual management landscape (Table 3-21). This designation was created prior to the onset of mining activities by FCMI in 1986, and reflects the fact that the area is visible to thousands of motorists on I-80 each day and lies at the base of the relatively scenic Humboldt Range.

Landscape character type is a unit of physiographic area having common characteristics of land forms, rock formations, water forms, and vegetation patterns. The study area and existing Florida Canyon Mine are located in the northwestern portion of the Great Basin region of the Basin and Range Physiographic Province. Lands within the project area are typical of the Basin and Range landscapes in northern Nevada with broad, open basins bounded by prominent north-south trending mountain ranges generally covered by piñon-juniper vegetation. This type of landscape allows for long viewing distances. The project area is located on the piedmont slopes of the Humboldt Range and slopes towards the Humboldt River/Rye Patch Reservoir to the west. To the east, the Humboldt Range rises sharply above the valley. Elevation within the project area ranges from approximately 4,200 feet to 6,200 feet above mean sea level.

The Humboldt Range forms the backdrop for views of the mine site from I-80 and Rye Patch Reservoir. The squat geometric shapes of the existing heap leach facility and waste rock dumps contrast strongly with natural forms of the Humboldt Range, which tend to be more rolling to rugged. Vegetation in the area, which consists mainly of sagebrush and grasses, provides relatively uniform coverage on the alluvial slopes near the mine area, while shrubs on the slopes of the Humboldt Range are irregular and patchy. Structures in the project area vicinity include offices and a shop/warehouse, a water tank (Figure 5, Appendix E) located on top of the existing heap leach pad, roads, trailers at the Humboldt Trailer Court, and a wood-pole transmission line.

Table 3-21

BLM Visual Resource Management Classes

Class	Description
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986.

At present, the most dominant man-made features within the study area include I-80, a pump station for a natural gas pipeline, the Humboldt House and farm, the wood-pole power transmission line, and the Florida Canyon Mine, which is readily apparent from I-80 and from viewpoints several miles in any direction. Major mining elements currently visible from vantage points within the area include a large heap leach facility that covers 321 acres and is over 200 feet in height, numerous waste rock dumps with steep slopes, and the evidence of exploration roads on the piedmont slopes above the active mine area. The heap leach facility and waste rock dumps have been constructed in several bench-like lifts, with any given lift containing a variety of earth-tone colors as a result of the varied origin of the deposited materials. These areas are generally devoid of vegetation.

To assess the degree of visual contrast that would result from implementation of the proposed project, KOPs were selected from which changes to the characteristic landscape could be compared. KOPs are typically chosen along commonly traveled routes or at other likely observation points (BLM 1986). For the purposes of this analysis, the following KOPs have been identified for this EIS. The location of the viewpoints and the direction of the view toward the study area are listed below and shown in Map 3-24:

1. Mile marker 136 on I-80;
2. Mile marker 138 on I-80, the Humboldt Interchange;
3. Mile marker 139.5 on I-80; and
4. Pitt-Taylor Dam, directly west of the Humboldt Interchange.

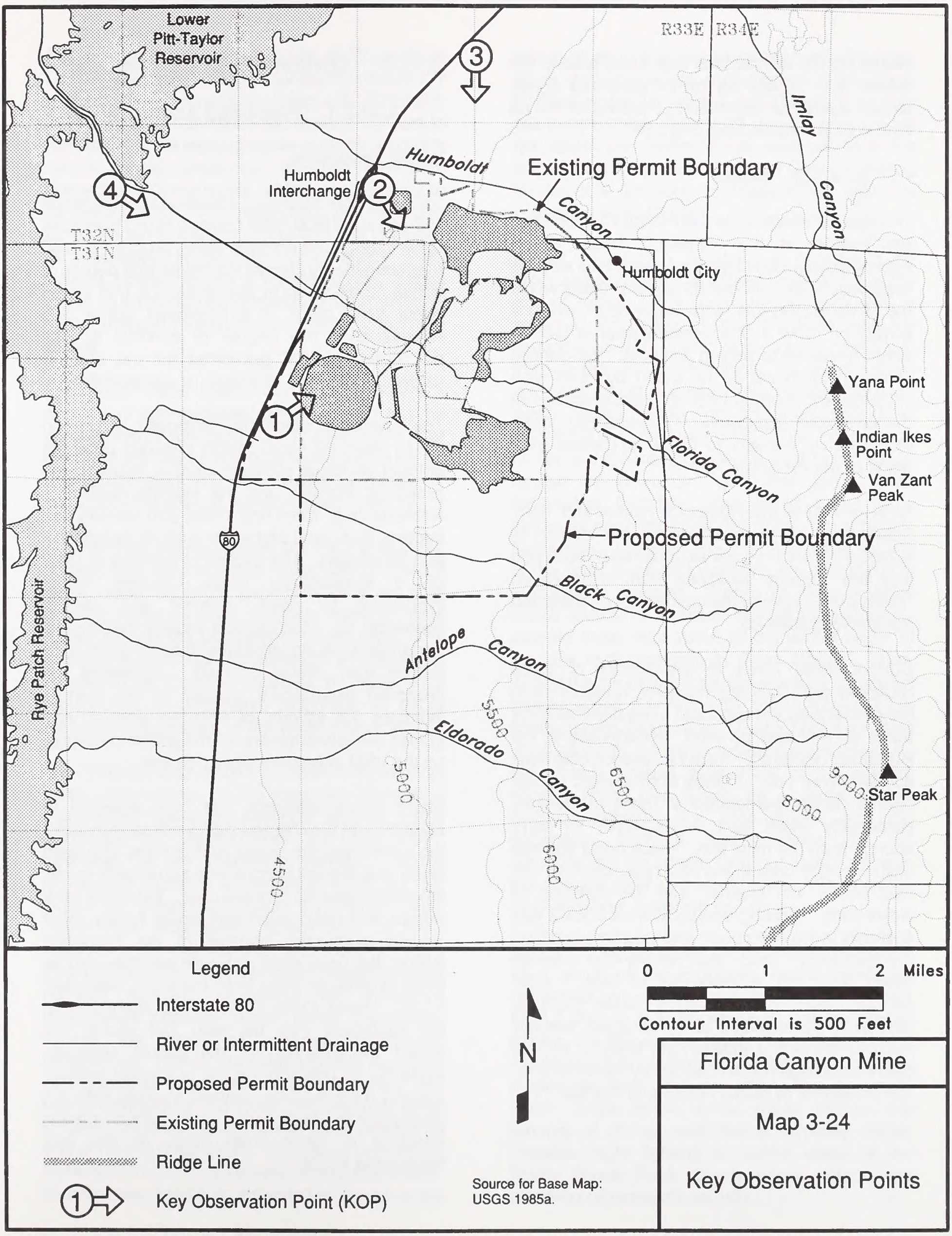
Appendix E contains BLM Visual Contrast Rating Worksheets that include descriptions of the existing visual environment as viewed from each of the four KOPs. Photographic simulations representing currently approved mining operations, end of mining under the Proposed Action, end of mining under the North Extension of the Heap Leach Pad Alternative, and reclamation of these alternatives have been developed for FCMI by Ellsworth and Associates, Landscape Architects, and also are included in Appendix E. Photographic simulations of the mine area as viewed from the southern end of Rye Patch Reservoir were not prepared as a result of the low visibility of the project area from that location.

<u>KOP 1</u>. KOP 1 is located along I-80 at mile marker 136 less than 0.5 mile southwest of the project area. From KOP 1, views of the project area extend to the northeast and east. The project area is in the middleground viewing zone and breaks into the skyline (Figure 1, Appendix E). From this location the existing mine is a dominant feature of the landscape and attracts viewer attention as a result of the reddish-brown colors of the South Waste Rock Dump and the heap leach facility. The upper portion of the pit high wall is currently visible from this KOP and appears as a dark crescent-shaped form taken from of the otherwise rounded piedmont slope.

<u>KOP 2</u>. KOP 2 is located along I-80 at the Humboldt Interchange (mile marker 138). From this KOP, the project lies approximately 0.6 mile to the south and southeast in the middleground viewing zone (Figure 3, Appendix E). The shrub-covered Humboldt Range provides a backdrop against which the unnatural forms of the North Waste Rock Dump and the existing heap leach facility contrast strongly. These mine elements appear largely as barren, steeply sloped landforms. The upper portion of the pit high wall also is visible from this KOP.

<u>KOP 3</u>. KOP 3 is located approximately 1.3 miles north of the project area, at I-80 mile marker 139.5. The project area appears in the middleground distance zone (Figure 5, Appendix E). From this vantage point, the existing mine area is less noticeable than from KOPs 1 and 2, largely because of the greater viewing distance and the fact that mine elements appear to more closely mimic the gradual alluvial slopes characteristic of the project area.

<u>KOP 4</u>. KOP 4 is located along the road to Pitt-Taylor Dam approximately 2 miles northwest of the project area. From this vantage point, the entire Humboldt Range forms a backdrop to the Florida Canyon Mine, which is located in the middleground/background distance zone (Figure 7, Appendix E). Mine elements are readily



Florida Canyon Mine

Map 3-24

Key Observation Points

visible on the alluvial fans that slope toward the viewer and appear as broad disturbed areas, largely devoid of vegetation. Portions of the pit high wall are visible from this KOP.

3.12.1.2 Noise

The nearest residents to the Florida Canyon Mine are located at the Humboldt Trailer Court, approximately 3,000 feet northwest of the existing heap leach pad. About 35 people reside within the 15 developed lots at the trailer court, which is owned by FCMI and was established in 1985 in direct response to mining activities. Residences at this location will be relocated by FCMI to a more distant location prior to implementation of the proposed expansion. Consequently, there would be no impacts to these residences as a result of the Proposed Action.

West of I-80 is the Humboldt House and farm. Residences at Humboldt House are located at least 6,800 feet from the existing heap leach pad and are partially screened from mine-related noises due to several mature deciduous trees and the above-grade I-80.

Current noise levels in the vicinity of these receptors are unknown; however, noise levels in the overall area are expected to be dominated by traffic on I-80 and by wind. Residences at the Humboldt House are located a distance of at least 800 feet from I-80. Noises from current mining operations are perceptible at these residences, particularly when light winds serve to carry sounds from the mine site. These noise sources include rotary drills in the open pits, blasting, ore haul trucks, the crusher, and the dumping of waste rock. Blasting occurs at least once a day (typically in the afternoon), and the short-duration, low-frequency "thud" that results can often be heard (and felt) at distances of over 1 mile. Although existing mine-related noises could be perceived by residents as a nuisance, outdoor noise levels at this location are likely to be well below standards recommended by the USEPA for the protection of public health and welfare.

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action

Visual Resources

Visual impacts have been assessed in accordance with standard BLM VRM contrast rating principles (BLM 1986). The contrast rating process is used to systematically identify the nature and degree of visible modification to the landscape that would occur as a result of a Proposed Action and Alternatives. The degree of contrast is then compared to VRM guidelines for the area to determine the level of impact or compatibility.

The extent to which the proposed expansion would affect the visual quality depends upon the amount of visual contrast created between the proposed facilities and the existing landscape elements (e.g., form, line, color, and texture) and features (e.g., land and water surface, vegetation, and structures). The degree of contrast is rated on a standardized Visual Contrast Rating Worksheet for each element and feature (Appendix E). Management actions that exceed visual management objectives may be required to reduce their overall contrast. Assessing the proposed expansion's contrast in this manner indicates the severity of potential impacts and guides the development of mitigation measures so the VRM objectives would be met.

Major mining elements that have potential to contrast with the characteristic landscape include: the open mine pits, waste rock dumps, and heap leach pad; the soil borrow area and growth media stockpiles; and the process plant. The waste rock dumps and heap leach pad would be the most visually prominent features of the Proposed Action; the open mine pit would be obscured by these facilities in views from the north, west, and south. Under Class II guidelines, alterations to the landscape may be seen, but should not attract the attention of the casual observer. However, as described in the preceding section, existing mine facilities contrast strongly with the characteristic landscape and attract viewer attention in views from three of the four designated KOPs.

The footprints of the North and South Waste Rock Dumps would be expanded by approximately 177 and 217 acres, respectively (Map 2-2). The North Waste Rock Dump would add at least 150 feet to the height of the existing waste rock dump by the end of mining operations. Similarly, the South Waste Rock Dump would add at least 250 feet to its current height. The waste rock dumps would be expanded in lifts from 50 to 150 feet in height. As described in Section 2.2.4, Waste Rock Dumps, outside slopes of the waste rock dumps would be reclaimed concurrently to approximately 3H:1V, thereby minimizing the extent of bench-like slopes.

The South Heap Leach Pad would require a footprint of approximately 203 acres. It would be constructed in successive 30- to 60-foot lifts over the life of the mine and would reach a total height of approximately 200 feet. Angle of repose of each ore lift would be approximately 1.4H:1V.

Dust plumes originating from the mine area could occasionally be visible for distances of several miles. Dust could be generated as a result of blasting in the pit area, vehicular traffic on haul roads, and by the dumping of waste rock. The creation of large dust plumes would be minimized by wetting dirt roads as proposed by FCMI. This requirement is considered adequate to avoid long-term impairment of the visual resource.

The following discussion describes in more detail those components of the proposed expansion that would result in changes to the visual landscape as viewed from the four KOPs described in the preceding section. Visual simulations included in Appendix E of this EIS depict the Proposed Action and North Heap Leach Pad Alternative during both of their maximum potential visual contrasts and 10 years after reclamation. The maximum potential visual contrast scenario represents the maximum disturbance possible under these alternatives without the benefit of proposed concurrent reclamation. That is, the visual benefits expected as a result of concurrent reclamation have not been incorporated into these simulations in order to depict the maximum potential visual contrast at end of mining (year 2002). The use of concurrent reclamation techniques during mining operations, as proposed, would be expected to minimize the extent of visual contrast associated with the heap leach pad and waste rock dumps since these facilities would be graded and reseeded as they are constructed. Therefore, the simulations do not depict the results of this reclamation at the end of mining operations. Visual Contrast Rating Worksheets for each of these KOPs also are presented in Appendix E.

<u>KOP 1</u>. Figure E-1, Appendix E, represents the proposed expansion as viewed from KOP 1 at the end of mining. The South Heap Leach Pad is shown in the center of this simulation, with the expanded South Waste Rock Dump shown in front of the Humboldt Range. All other project elements would not be visible behind the heap leach facility when viewed from this KOP (including the pit high wall). The heap leach facility and the expanded waste rock dump would appear as prominent geometric forms, with terrace-like benches, and would result in a moderate contrast with forms of the characteristic landscape. The bold line created by the flat top of the heap leach and waste rock would result in a moderate contrast. Slopes of these facilities would consist of a mosaic of light to moderately colored hues, as a result of the varied origin of the raw rock materials in these slopes. Thus, during the life of the mine, the sparsely vegetated slopes would contrast with colors found in the characteristic landscape. These contrasts were rated as weak, however, because such contrasts are already present as a result of the existing mine. There also would be a slight texture contrast between the bare slopes and the vegetation textures and patterns in the characteristic landscape. Outdoor night lighting at the process area also would attract the attention of east-bound motorists on I-80.

<u>KOP 2</u>. Changes to the characteristic landscape as a result of the Proposed Action would be noticeable and would attract viewer attention from KOP 2 (Figure E-3, Appendix E). At the end of mining, the lifts on the North Waste Rock Dump would result in moderate contrasts with existing landforms, lines, and textures. The expanded North Waste Rock Dump would reduce the amount of pit high wall that is currently visible. Portable night lighting on active areas of the North Waste Rock Dump would attract the attention of motorists on I-80.

KOP 3. Changes to the landscape when viewed from KOP 3 would not be readily apparent to the casual observer due to the longer viewing distance and viewing angle (Figure E-5, Appendix E). Major mining elements visible at the end of mining include the North Waste Rock Dump and the existing heap leach pad. The form of the North Waste Rock Dump would create a weak contrast with existing land forms. At this viewing distance, the lines, colors, and textures of mine elements associated with the proposed expansion would appear to blend with those of existing mine elements.

KOP 4. When viewed from KOP 4, both the expanded North and South Waste Rock Dumps and the existing and proposed South Heap Leach facilities would be visible at a distance of 2 miles (Figure E-7, Appendix E). The prominent geometric forms and lines of the expanded facilities would contrast moderately with the more subtle forms and lines of the characteristic landscape. Portions of the pit high walls would remain visible. From this viewing distance, contrasts in color and texture would be weak and non-existent, respectively.

Overall, the proposed expansion would contrast with the existing forms, lines, and textures of the characteristic landscape. Consequently, the proposed expansion at the end of mining (2002) would not be consistent with VRM Class II objectives as a result of contrasts with the predominant landscape that have been rated as moderate. These contrasts would tend to attract the attention of the casual observer and would not repeat basic elements present in the landscape. Proposed concurrent reclamation would reduce these impacts, but Class II standards would continue to be exceeded during the life of mining operations.

Noise

Although the proposed expansion would perpetuate the types of noises that currently are generated by mining activity at the Florida Canyon Mine, it also would extend the overall life of the mine, during which time sensitive receptors would continue to experience mine-related noises throughout the day and night. Specifically, the proposed project would extend the life of current mining operations an additional 5 years, through the year 2002. Sound levels from mining activities during this period are expected to be similar to those that occur now; blasting would continue within the open pit during daylight hours and construction equipment (i.e., drills, bulldozers, loaders, and haul trucks) would operate 24 hours per day. Because mine expansion is not expected to significantly intensify sound levels, as compared to current mining operations, noise impacts to nearby residents would not be significant. Operations-related noises from the mine area would continue to be heard at these receptors and could often be audible above ambient background levels; however, these noises typically would not be expected to result in widespread annoyance or complaints.

With the proposed mine project, waste rock dumping operations would be expanded and the North Waste Rock Dump would advance closer to the Humboldt House. This change would bring noise sources on the dump closer to residences at the Humboldt House and would, as a consequence, serve to increase sound levels perceived by residents. Sounds from haul trucks, back-up warning alarms, rock dumping, and bulldozers would be louder than they are at present and could be perceived by some residents as a nuisance, particularly at night. As with current mining operations, anticipated noise levels from proposed operations could be perceived by residents of the Humboldt House as a nuisance; however, outdoor noise levels at this location would still be expected to remain below standards recommended by the USEPA for the protection of public health and welfare.

Crusher operations under the proposed expansion would be moved from their current location. Consequently, noises from crusher operations, if currently perceptible at Humboldt House, would likely be eliminated as a result of their greater distance. Also, the new crusher area would be completely screened behind the existing heap leach pad minimizing potential noise effects.

Blasting during the life of the proposed expansion would occur during daylight hours only, and noise experienced at any one site would be of very short duration (approximately 0.5 second). Blasting would occur below ground level and

noise from blasting would largely be attenuated by the surrounding terrain. No changes in the size of charges used or method of detonation from the existing (on-going) blasting program are anticipated. Under the proposed expansion, blasting noise would continue an additional 5 years and could startle and/or annoy residents at Humboldt House even though such noise currently occurs, and would continue to occur, at regular intervals on a daily basis. The proposed expansion would represent only an increase in the duration over which currently ongoing noises would occur.

The proposed expansion is not expected to result in a long-term increase in traffic over current mining-related levels. Consequently, the proposed project would not contribute to an increase in noise along local roadways during the extended life of mining operations.

<u>Mine Closure</u>

During mining closure activities, the waste rock dumps would be graded to eliminate the benches between lifts, reduce the side slopes to an approximate 3H:1V grade, and round-off waste rock to approximate more natural contours. The North Heap Leach Pad would remain an additional 1 to 2 years, after which time it would be graded in a similar fashion. Mine access roads would be ripped and reseeded, and buildings and ancillary facilities would be removed and their foundations ripped and reseeded. Noise levels associated with mine closure activities would not be expected to differ significantly from those described for mining operations, since the primary noise sources would be from the use of bulldozers and other heavy equipment; however, these noise-generating activities would only occur during daylight hours. Blasting would cease with mine closure.

<u>Mine Reclamation</u>

Reclamation activities proposed by FCMI are described in Section 2.2.15, Reclamation, and include slope grading and stabilization, the application of growth media, and the seeding of disturbed areas. Figures E-2, E-4, E-6, and E-8 in Appendix E depict anticipated conditions 10 years after reclamation begins under the proposed expansion. The grading of waste rock and heap leach slopes from angle of repose to approximately 3H:1V would create undulating slopes that would more closely approximate the appearance of natural slopes in the area. These efforts would reduce any moderate contrasts in land forms and lines associated with the proposed expansion to weak contrasts, that would not tend to attract the attention of the casual observer.

Revegetation practices at the Florida Canyon Mine to date have been extremely successful and have resulted in densities of both grasses and shrubs that exceed those of adjacent undisturbed areas. Assuming the revegetation program for the proposed expansion meets with similar success, visual contrasts associated with all current and proposed mine disturbance would be greatly reduced over time. Within a few years, grasses and shrubs on the waste rock dumps and leach pads would allow these areas to blend with the color and texture of the existing natural landscape, thereby eliminating any moderate or weak contrasts associated with the proposed expansion. Therefore, visual contrasts associated with the proposed expansion would be reduced over time and would repeat the basic elements of form, line, color and texture found in the characteristic landscape. The reclaimed mine area would not attract the attention of the casual observer when viewed from any of the four KOPs used in this analysis. Consequently, the proposed expansion would conform to VRM Class II guidelines after the reclamation period.

Noise levels associated with mine reclamation activities would not be expected to differ significantly from those described for mining operations. As with mine closure, the primary noise sources from reclamation activities would be from the use of bulldozers and other heavy equipment. These noises would diminish over the reclamation period as site activities and related traffic diminish. After the reclamation period, noise in the vicinity of the mine site would return to pre-mining levels.

3.12.2.2 North Extension of the Heap Leach Pad Alternative

Implementation of the North Extension of the Heap Leach Pad Alternative would result in visual contrasts that would be almost identical to those described for the Proposed Action. Expansion of the existing heap leach facility under this alternative would disturb an additional 156 acres; construction of the South Heap Leach Pad would not occur. The footprints of the North and South Waste Rock Dumps would be expanded by 92 and 248 acres, respectively. The only visual change that would be noticeable in views from KOP 1 would be the westward expansion of the South Waste Rock Dump, which was rated as a weak contrast; the pit high wall would remain visible (Figure E-1, Appendix E). In views from KOP 2, only weak contrasts were identified as a result of the expanded heap and North Waste Rock Dump (Figure E-3, Appendix E). Changes in major mine elements were considered to be weak or not evident in views from KOP 3 (Figure E-5, Appendix E). Outdoor night lighting at the mine site would attract attention in views from KOPs 2 and 3. The largest contrast (rated as moderate) associated with this alternative would result from the strong geometric forms and lines created by the expansion of the waste rock dumps and leach pad, when viewed from KOP 4 (Figure E-7, Appendix E); consequently, this alternative would not be consistent with VRM Class II objectives during the life of mining.

Reclamation practices associated with the North Extension of the Heap Leach Pad Alternative would be identical to those described for the Proposed Action (Section 2.2.15, Reclamation). As with the Proposed Action, this alternative would be expected to meet VRM objectives within 10 years of the onset of mine reclamation (Figures E-2, E-4, E-6, and E-8 in Appendix E).

Noise impacts associated with mine operations, closure, and reclamation under the North Extension of the Heap Leach Pad Alternative are not expected to differ from those described for the Proposed Action. Extension of the heap leach pad would shorten the distance between active areas of leach operations and the nearest sensitive receptor (Humboldt House). However, noise levels from operations at the heap leach area are not expected to be louder than those described for waste rock dumping associated with the Proposed Action on the North Waste Rock Dump.

3.12.2.3 No Action Alternative

Under the No Action Alternative, currently permitted mining operations would continue through late 1997, after which time the Florida Canyon Mine would cease operations. The additional disturbance associated with the Proposed Action (expansion of the open pits, waste rock dumps, and the construction of a new heap leach pad and other mining-related facilities) would not occur within the project area. The visual environment at the end of current mining operations from each of the four KOPs would be as depicted in Figures E-1, E-3, E-5, and E-7 in Appendix E. FCMI would be required to reclaim surface disturbances associated with its ongoing exploration program, and the 10-year after reclamation scenario from each of the KOPs is depicted in Figures E-2, E-4, E-6, and E-8 in Appendix E. Noise from current mining operations would continue under the No Action Alternative until late 1997. Noise levels in the mine area would return to pre-mining levels after closure and reclamation activities were complete.

3.12.3 Cumulative Impacts

Cumulative effects to visual resources were considered for all past, present, and reasonably foreseeable future developments listed in Section 1.4, Interrelated Projects, that have the potential to be visible from either of the four KOPs identified in Section 3.12.1, Affected Environment. These developments include the Rye Patch Geothermal Project and a 7-acre, unreclaimed mine located in T31N, R33E, Section 22. Neither project lies within the field-of-view of photographs taken from KOPs 1, 2, or 3 (Figures E-1, E-3, and E-5 in Appendix E). The Rye Patch Geothermal Project also is out of the field-of-view of the photograph taken from KOP 4. Disturbance associated with the 7-acre mine in Section 22 lies within the field-of-view from KOP 4, but is not visible from this viewing angle (Figure E-7,

Appendix E). No projects identified in Section 1.4, Interrelated Projects, as reasonably foreseeable future actions (RFFAs) would lie within the field-of-view of any of these KOPs. Therefore, the Proposed Action would not result in cumulative impacts to visual resources when viewed from either of the KOPs used in this analysis.

3.12.4 Potential Mitigation and Monitoring

Issue: Outdoor night lighting of facilities at the proposed mine would attract the attention of motorists on I-80.

Measure 1: Outdoor night lighting at the Florida Canyon Mine would be shielded and directed downward where possible.

Effectiveness: Proper shielding and directing of outdoor lights would reduce, but not eliminate, skyward illumination and glare.

Application: This measure would apply only to the Proposed Action and North Extension of the Heap Leach Pad Alternative.

3.12.5 Residual Adverse Impacts

Class II VRM objectives would not be achieved during the life of the proposed project, in views from three of the four KOPs, as a result of moderate contrasts resulting from the heap leach pad and expanded waste rock dumps. Class II objectives would be achieved, however, after successful reclamation of all mine-related disturbances, which has been estimated to be approximately 8 years after mine closure. Proposed reclamation would notably reduce form, line, and textural contrasts over the long-term. If expected benefits to the visual environment from reclamation activities were not realized, contrasts of color and texture on disturbed areas would remain indefinitely.

Outdoor night lighting at the Florida Canyon mine would continue to attract the attention of passing motorists and be visible from nearby residences during the life-of-mine operations. Mitigative measures to shield night lighting, however, would reduce excessive skyward illumination and glare. Night lighting of mine facilities would be discontinued upon mine closure; these impacts therefore would be considered short-term.

3.13 Social and Economic Values

3.13.1 Affected Environment

This section describes the social and economic conditions in the project area. The study area is determined by the areas where socioeconomic impacts occur. The Florida Canyon Mine is located in Pershing County. The majority of current mine employees reside in Winnemucca, in Humboldt County. The current residence pattern of employees of the Florida Canyon Mine is shown in Table 3-22. Approximately 95 percent of current employees live within 60 miles of the mine site, including 65 percent in Winnemucca, 21 percent in Lovelock, and 9 percent in Imlay. Approximately 4 percent live between 60 and 170 miles away, including 2 percent located in Fallon, in neighboring Churchill County. Approximately 2 percent live 200 miles or more from the mine site, including areas outside of Nevada (Montana, Idaho, and California). Those whose permanent residence is a great distance from the mine site reside locally during the 4-day work week and commute home on the weekends.

As determined by the employee residence pattern and the mine location, the analysis area for social and economic issues encompasses primarily Pershing and Humboldt Counties and the major communities of Winnemucca and Lovelock. Issues discussed in this section include population; economy, employment, and income; housing and community services; and government and public finance. The following description of the affected environment was developed through review of existing literature and statistical data, and through direct contact with area representatives, and local, state, and Federal agencies.

3.13.1.1 Population And Demography

Pershing and Humboldt Counties are sparsely populated, rural counties. This area of Nevada has demonstrated a strong growth trend over the past two decades, largely in response to the growth in the mining industry. Table 3-23 shows population statistics for the study area from 1990 to 1996. Humboldt County population increased 26.4 percent during this period, or an average of 4.4 percent per year, to a 1996 population of 16,460 (Bureau of Business and Economic Research 1997). Pershing County population increased 37.6 percent during the period, or an average of 6.3 percent per year, to a 1996 population of 6,260. Population densities for Pershing and Humboldt Counties in 1996 were approximately 1.0 and 1.7 persons per square mile, respectively. According to 1990 census data, 20.6 percent of Pershing County's population was made up of minorities (non-whites). Humboldt County had 24.3 percent minorities, a relatively high number for Nevada due to the large number of Hispanics employed in agricultural labor. Age distribution in both counties is similar to the pattern in the rest of the state and nation (Tri-County Development Authority 1995, 1996a).

Approximately 48 percent of Humboldt County's population resides in the town of Winnemucca, which had a 1996 population of 7,890 (Bureau of Business and Economic Research 1997). Winnemucca's population increased 27.7 percent from 1990 to 1996, or an average of 4.6 percent per year. The small community of Golconda, located 16 miles from Winnemucca, has an estimated population of 400 to 500. Approximately 45 percent of Pershing County's population resides in the town of Lovelock, which had a 1996 population of 2,790. Lovelock's population increased 31.0 percent from 1990 to 1996, or an average of 5.2 percent per year. Several small communities are located near the mine site in Pershing County between Lovelock and Winnemucca. These include Imlay (estimated population of 300), and Mill City, Unionville, and Oreana (historic communities with only 10 or 20 current residents).

Continued strong growth is anticipated for Humboldt and Pershing Counties through 2007, although growth rates are not expected to be as high as in the 1990 to 1996 period. Humboldt County's population is anticipated to increase 26.6 percent in the 10-year period from 1997 to 2007, or approximately 2.7 percent per year, to reach a 2007 population of 21,534. Pershing County's population is anticipated to increase 20 percent in the 10-year period, or approximately 2 percent per year, to reach a 2007 population of

Table 3-22

Florida Canyon Mine Employee Residence Pattern

Town	Number of Employees
Winnemucca	213
Lovelock	68
Imlay	28
Golconda	1
Unionville	1
Fallon	8
Elko	1
Orovada	2
Silver Springs	1
Towns greater than 200 miles away	5
TOTAL	328

Source: Muir 1997.

Table 3-23

Study Area Population

	1990	1991	1992	1993	1994	1995	1996	Percent Change 1990-96	Average Annual Growth Rate 1990-96
Humboldt County	13,020	13,500	14,000	14,510	15,640	16,270	16,460	26.4%	4.4%
Winnemucca	6,180	6,560	6,640	6,910	7,170	7,380	7,890	27.7%	4.6%
Pershing County	4,550	4,700	4,800	4,690	4,790	5,140	6,260	37.6%	6.3%
Lovelock	2,130	2,220	2,380	2,400	2,340	2,490	2,790	31.0%	5.2%

Source: Bureau of Business and Economic Research 1997, except as noted.

7,676 (Bureau of Business and Economic Research 1997).

3.13.1.2 Economy, Employment, and Income

<u>Overview of the Economy</u>

The economies of Humboldt and Pershing Counties have historically depended on agriculture and mining. The area around Lovelock, in Pershing County, was once an important stop on the Immigrant Trail, as it was the last place for travelers to find abundant grass to feed livestock before crossing the 40-mile Desert. Lovelock Valley, the terminus of the Humboldt River, first attracted settlers who began farming in 1861. Winnemucca, in Humboldt County, developed around a trading post located at an important fording site on the Humboldt River for westward-bound pioneers on the Immigrant Trail. In 1869, the Central Pacific Railroad further bolstered the area's economic growth. The town of Lovelock developed around the newly constructed railroad. Winnemucca continued to be a major trade center for the area, and extended its role as a rest stop for travelers with the construction of Interstate 80 (Sierra Pacific Power Company 1996; BLM 1996).

Mining, with its boom and bust history, has played a major role in the economy of the area since the first rushes for gold and silver occurred. In the early 1900s, the silver rush resulted in a significant influx of prospectors and related population growth. The most recent boom, associated with the development of Carlin-type gold deposits, peaked in the late 1980s, but continues today. The economies of Humboldt and Pershing Counties continue to be based primarily on the mining industry, and to a lesser extent agriculture and tourism. A study conducted by the Economic Development Administration's University Center for Economic Development at the University of Nevada, Reno reported that over 56 percent of total economic activity in Humboldt County is created by the gold mining sector. Thus, while direct employment by the mining industry accounted for less than one-third of the labor force in Humboldt County, the industry provided over one-half of the economic activity and three-quarters of the income in the county (Tingley et al. 1993; BLM 1996; Tri-County Development Authority 1996a).

This economic dependence on the mining industry makes the regional economy very vulnerable to external conditions, such as fluctuations in world metals demand and prices. This potential risk has been noted by local development authorities. Overall Economic Development Plans have been developed for both Humboldt and Pershing Counties to provide direction and support in developing other industries and economic activities in order to diversify the economy. Target industries for development include gaming/tourism, recreation, agriculture, geothermal resources, and industrial development (BLM 1996; Tri-County Development Authority 1995, 1996a).

Agriculture continues to contribute to the base of economic activity in both Pershing and Humboldt Counties. In 1992, there were 128 farms and ranches in Pershing County, encompassing 624,606 acres, and 200 farms and ranches in Humboldt County, encompassing 738,041 acres. Cash receipts from the marketing of crops and livestock in 1994 were $26,879,000 in Pershing County and $49,467,000 in Humboldt County. Cash receipts in both counties fluctuated between 1980 and 1994, but the agricultural work force has increased overall. Humboldt County is one of the leading agricultural counties in Nevada. Recently, drought conditions have affected agriculture, particularly in Pershing County. The livestock industry plays an important role in both counties, with 26,000 head of cattle in Pershing County and 55,000 in Humboldt County (Nevada Department of Administration 1996).

Tourism has become increasingly important in the economy with the growth in the gaming industry, as is reflected in the recent increases in the services and trade sectors. These activities center around the urban areas of Winnemucca and Lovelock. The services and trade sectors, in general, require much lower skill levels for operation and, therefore, average wages are much lower in these sectors than in the mining sector. These sectors do contribute to regional economic diversity. The construction of a correctional facility in Pershing County in 1994 also has added diversity to the economic base in

the area (BLM 1996; Tri-County Development Authority 1995).

Employment and Income

Pershing County and Humboldt County labor force, employment, and wage statistics are shown in Tables 3-24 and 3-25. Between 1991 and 1995, Pershing County labor force remained fairly constant, measuring 2,000 in 1995 (Research and Analysis Bureau 1991-1995; Employment Security Department 1991). The unemployment rate fluctuated, averaging around 5.8 percent. The Humboldt County labor force increased 7.3 percent in the 5-year period to a 1995 figure of 7,960. The unemployment rate fluctuated, averaging around 5.3 percent. The unemployment rates in both Pershing and Humboldt Counties have been low recently, measuring 5.5 percent and 4.4 percent, respectively, in 1995. The Nevada Research and Analysis Bureau measured job growth rates in Nevada by county from 1994 to 1995. Although the strongest job growth has typically occurred in the urban areas around Las Vegas and Reno, both Humboldt and Pershing Counties, as rural counties, showed healthy growth rates, with 7.1 percent and 8.4 percent increases, respectively (Research and Analysis Bureau 1996).

Non-agricultural employment by sector information is displayed in Tables 3-24 and 3-25. The most important non-agricultural employment sectors in Pershing County are mining (36.2 percent of 1995 employment), government (23.4 percent), trade (18.8 percent), and services (15.0 percent) (Research and Analysis Bureau 1991-1995; Employment Security Department 1991). In the 5 years from 1991 to 1995, growth occurred primarily in the services and government sectors. Mining employment increased slightly. In 1994, there were five major mining operations in Pershing County, including the Florida Canyon Mine (Tri-County Development Authority 1995). Current employment at the mine is 328; this provides approximately 48 percent of county mining employment and 17 percent of total county non-agricultural employment.

Humboldt County's distribution of non-agricultural employment by sector is similar to Pershing County's, with slightly smaller portions attributable to mining (29.7 percent), government (14.5 percent), and trade (17.9 percent), and more to services (25.2 percent), reflecting the commercial activity in Winnemucca. Mining employment in Humboldt County is over three times that of Pershing County, however, and this sector provided the most dramatic increases for Humboldt County in the 5-year period (adding 545 positions or an increase of over 30 percent). Services sector employment also increased over 30 percent (or 455 positions) (Research and Analysis Bureau 1991-1995; Employment Security Department 1991).

Average wages in the mining sector are the highest of any employment sector (Tables 3-24 and 3-25). The 1995 average annual pay in Pershing County over all industries was $27,743, while the average pay in the mining sector was $41,449 (Research and Analysis Bureau 1995). Average annual pay in the services sector was $17,481, making it the second lowest paid non-agricultural employment sector. Mining provided 54.0 percent of the total direct payroll earned in Pershing County in 1995. Services provided only 9.4 percent (government was second highest, with 22.1 percent). Figures for Humboldt County were similar. Mining provided 46.8 percent of the total direct payroll earned in 1995, government 14.8 percent, and services 13.6 percent. Average annual pay in Humboldt County is slightly higher than Pershing County for all industries, except services, which is lower ($15,366). Annual payroll at Florida Canyon Mine in 1996 was approximately $14,889,024, with an average annual wage of $35,000 (excluding benefits) (Muir 1997).

Indirect Contributions of Mining

As stated before, the total economic contribution provided by mining is greater than simply direct employment or wages. Mining industry employment supports secondary employment in other industries, particularly services, through the spending of workers' wages in the local economy, and also through the purchase of goods and services by mining firms. Secondary employment is calculated for the mining industry using a multiplier of 1.24 for rural settings in Nevada (Dobra 1998, 1989). For every direct job

Table 3-24

Pershing County
Labor Force Summary

	1991	1992	1993	1994	1995	Percent of Employment 1995	Percent of Payroll 1995	Average Annual Pay 1995
Total Labor Force[1]	2,040	2,120	2,030	2,000	2,000	---	---	---
Unemployment	80	130	140	140	110	---	---	---
Unemployment Rate	4.0%	6.2%	6.7%	6.8%	5.5%	---	---	---
Employment by Sector:[2]								
Mining	650	660	620	681	682	36.2%	54.0%	$41,449
Construction	20	30	50	12	25	1.3%	1.1%	$23,659
Manufacturing	60	50	20	32	32	1.7%	1.1%	$18,303
Transportation, Communication, & Utilities	60	60	60	54	51	2.7%	3.5%	$36,260
Wholesale and Retail Trade	380	360	340	345	355	18.8%	8.0%	$11,832
Finance, Insurance, & Real Estate	20	20	20	16	18	1.0%	0.6%	$18,412
Service Industries	160	150	160	242	282	15.0%	9.4%	$17,481
Government	330	370	370	357	442	23.4%	22.1%	$26,169
TOTAL, All Industries	1,670	1,690	1,650	1,740	1,886	100.0%	100.0%	$27,743

[1]Reflects employment by place of residence.

[2]Reflects non-agricultural employment by place of employment.

Note: Numbers may not add to total due to rounding.

Source: Research and Analysis Bureau 1991-1995; Employment Security Department 1991.

Table 3-25

Humboldt County
Labor Force Summary

	1991	1992	1993	1994	1995	Percent of Employment 1995	Percent of Payroll 1995	Average Annual Pay 1995
Total Labor Force[1]	7,420	7,650	7,880	7,870	7,960	---	---	---
Unemployment	330	430	480	460	350	---	---	---
Unemployment Rate	4.5%	5.6%	6.1%	5.8%	4.4%	---	---	---
Employment by Sector:[2]								
Mining	1,760	2,000	2,090	2,075	2,305	29.7%	46.8%	$44,971
Construction	490	360	370	369	414	5.3%	5.8%	$31,151
Manufacturing	110	100	100	102	134	1.7%	1.8%	$29,354
Transportation, Communicatin, & Utilities	300	310	300	305	335	4.3%	6.1%	$40,251
Wholesale and Retail Trade	1,120	1,030	1,170	1,271	1,394	17.9%	10.3%	$16,406
Finance, Insurance, & Real Estate	90	90	100	107	102	1.3%	1.0%	$21,867
Service Industries	1,500	1,470	1,520	1,860	1,955	25.2%	13.6%	$15,366
Government	1,050	1,180	1,230	1,163	1,130	14.5%	14.8%	$28,781
TOTAL, All Industries	6,420	6,540	6,890	7,253	7,770	100.0%	100.0%	$28,525

[1]Reflects employment by place of residence.

[2]Reflects non-agricultural employment by place of employment.

Note: Numbers may not add to total due to rounding.

Source: Research and Analysis Bureau 1991-1995; Employment Security Department 1991.

in the mining industry, 0.74 indirect jobs are created in the local economy, and 0.5 jobs are created in the large urban economies of the state, which serve as supply centers. This multiplier was determined by John Dobra, an economist at the University of Nevada, Reno, in 1988, and it has been used in numerous socioeconomic analyses for mines in Nevada. Using this multiplier, secondary employment in local communities supported by Florida Canyon Mine direct employment is estimated to be 242. Most of these jobs occur in the services and trade sectors.

Mining, as an export industry, is an important income-generator for the state and has the largest earnings multipliers of any industry. The majority of the revenue from the sale of the product is spent within the state on wages, taxes, purchases of goods and services, and other production expenses. The total earnings generated through mining activity, as income cycles through the economy, can be estimated using a multiplier of 1.57 (Dobra 1989). This number applies to the amount spent directly on payroll, (i.e., for every payroll dollar in the mining industry, an additional $1.57 in earnings is generated for other Nevadans in the form of wages and salaries, rents, interest, and business incomes). Using this multiplier, the $14.9 million in payroll (1996) at Florida Canyon Mine is estimated to generate approximately $23.3 million in additional earnings throughout the state.

3.13.1.3 Housing and Community Services

Housing and community services are analyzed to the extent that they would be impacted by population changes generated by the proposed project. Based on the current employee residence distribution (Table 3-22), the primary communities affected are Winnemucca and Lovelock. Residence of employees in other communities is negligible. This section describes the housing and basic public services available in these communities.

Housing

The 1990 U.S. Census reported that there were 5,044 total housing units in Humboldt County, with 506 of these units vacant (U.S. Department of Commerce 1991). The housing stock consisted of 2,421 single-family units, 502 attached and apartment units, and 2,121 mobile homes. Of the Humboldt County housing stock, 2,442 housing units were located in Winnemucca (1,413 single-family units, 442 attached and apartment units, and 587 mobile homes). The 1996 Overall Economic Development Plan Update for Humboldt County reports that between 1991 and 1995, 180 housing units were constructed in Winnemucca (Tri-County Development Authority 1996a). During the same period, 824 housing units were built in unincorporated Humboldt County, of which 42 were single family units and 782 were mobile homes.

Demand for housing in Humboldt County has been very high for the past 10 years. In 1995, prices for homes in the Winnemucca area ranged from $37,500 to $199,000, with an average price of $110,000. Manufactured housing prices ranged from $25,000 to $132,000. Residential lots in the city ranged from $25,000 to $32,000 depending upon size and location. The average lot size is 8,000 to 9,000 square feet, with a price of $29,000. A total of 178 housing units were sold through the Winnemucca Listing Service in 1995, of which 45 units were manufactured housing. Among the 133 homes sold, 20 were newly constructed. According to area realtors in 1996, listings are on the market from 60 to 120 days, depending on quality and price (BLM 1996).

The 1990 U.S. Census reported that there were 1,908 total housing units in Pershing County, with 294 units vacant (U.S. Department of Commerce 1991). The housing stock consisted of 911 single-family units, 206 attached and apartment units, and 791 mobile homes and other types of units. Of the Pershing County housing stock, 892 housing units were located in Lovelock (505 single-family units, 172 attached and apartment units, and 215 mobile homes and other types of units). The 1995 Overall Economic Development Plan Update for Pershing County reported that demand for housing has typically been low in recent years; however, the influx of employees for the new correctional facility has increased demand substantially (Tri-County Development Authority 1995). Several residential subdivisions were scheduled to begin construction by June

1995. Upon completion, these projects (Meadow Estates and Borland Estates) would add 63 and 300 family residential units, respectively. In 1995, prices for single-family homes in the Lovelock area ranged from $56,000 to $90,000, with an average price of $75,000. Mobile home prices ranged from $40,000 to $65,000, with an average price of $55,000.

According to the 1990 Census, there were approximately 1,484 rental units in Humboldt County, with 871 rental units in Winnemucca (U.S. Department of Commerce 1991). In Pershing County, there were 634 rental units, with 368 units in Lovelock. According to area realtors and property management personnel in 1996, the rental markets in the region are very limited (BLM 1996). In the Winnemucca area, it was reported that there is a zero vacancy rate for rental units. In many cases there are waiting lists for these units. According to local realtors, the average monthly rent in the Winnemucca region for homes, apartments, or mobile homes in 1995 were $400 to $450 for 1-bedroom units, $450 to $500 for 2-bedroom units, and $500 and up for 3-bedroom units. According to a 1996 community profile of Pershing County, the average rent for a 2-bedroom multi-family unit in Lovelock was $450 (Tri-County Development Authority 1996b).

Temporary housing in Humboldt County is concentrated in Winnemucca. There are an estimated 1,600 hotel/motel rooms in Winnemucca (Tri-County Development Authority 1996b). At least a third of these rooms are available for rental by the week (JBR Environmental Consultants, Inc. 1995). Temporary housing in Pershing County is concentrated in Lovelock. There are 13 hotels/motels in Lovelock, with approximately 260 rooms (Tri-County Development Authority 1997). Parking and hook-up services for recreational vehicles also are available in the project area. The busiest tourist season begins in June and ends in September. Weekend vacancy rates for temporary housing accommodations in Winnemucca during this period are frequently near zero (BLM 1996).

Water Supply

It is estimated that 50 percent of Humboldt County households are served by either a public or private water company. The Winnemucca area is served by the city's water system. Two other water districts exist in the county. The remainder of the county utilizes water from individually drilled wells, developed springs, or localized non-community systems. The Winnemucca water system serves approximately 3,000 customers. The average demand is 3.0 million gallons per day (mgd), with a peak demand of 6.5 mgd during the summer months. Water is supplied by a system of four deep wells and one developed spring. Total storage capacity is 7.85 million gallons in several storage tanks. Current annual use on the system is approximately 2,500 acre-feet per year. A recent study concluded that an ultimate build-out (full development) of the Winnemucca service territory would require approximately 11,205 acre-feet per year. It is estimated that the system is capable or nearly capable of providing this amount of water (Tri-County Development Authority 1996a).

The Lovelock Meadows Water District provides water to the city of Lovelock. The remainder of Pershing County utilizes individually drilled wells or developed springs. The Lovelock water system serves approximately 1,216 customers. The average demand is 1.0 mgd in winter, and 2.0 mgd in summer. Water is supplied by two electrically-pumped, deep wells. Total storage capacity is 2.5 million gallons in two tanks. Excess capacity exists in the current pumping system to serve additional customers; the total capacity is 3.6 mgd (Tri-County Development Authority 1995 and 1997).

Wastewater Treatment

Approximately 66 percent of all Humboldt County households are connected to a wastewater treatment facility. Winnemucca has a wastewater treatment facility; two other small treatment facilities exist in the county. The remainder of the county utilizes individual septic systems. The Winnemucca facility has a 1.5 mgd capacity, and serves approximately 2,800 customers. The average flow in the system is 0.98 mgd (approximately 65 percent of capacity), with a

peak flow in the summer months of 1.1 mgd (approximately 73 percent of capacity). The collection system presently consists of three large and two small lift stations. Excess capacity exists in the system to serve additional customers; however, any development outside of the present service area would require construction of additional lines (Tri-County Development Authority 1996a; BLM 1996).

The City of Lovelock has a wastewater treatment system. All remaining areas in Pershing County utilize individual septic systems. The Lovelock treatment system serves all residents and businesses within the city, or approximately 1,295 customers, with 84 standby services. Wastewater is treated with a 5-acre aerated lagoon. The system has the capacity to serve approximately 5,000 customers; service is presently operating at approximately 26 percent of capacity (Tri-County Development Authority 1995, 1997).

Solid Waste Disposal

In 1995, there were 10 rural landfills in Humboldt County. Most of these were scheduled to be closed by the end of 1997 due to recent changes in Federal and state regulations. A private operator currently directs the Winnemucca Area Solid Waste Management District, under contract with the City of Winnemucca and Humboldt County. The regional landfill is located 5 miles north of Winnemucca. The landfill is being permitted as a non-hazardous municipal solid waste landfill. The current site encompasses 240 acres and is located adjacent to BLM land, which could likely be permitted and utilized for expansion, when necessary. Collection service in the Winnemucca area is provided by two private operators (Tri-County Development Authority 1996a; BLM 1996).

Solid waste disposal in Pershing County is provided by the county. The Pershing County Solid Waste Management District was closed in 1995 due to changes in Federal and state regulations. Following closure, the county was scheduled to begin utilizing a 5,370-square foot transfer station, which is covered by a pre-engineered metal building on a concrete slab. Collection service for the Lovelock area is provided by two private operators. The average daily volume of solid waste generated in the Lovelock area is less than 8 tons per day (Tri-County Development Authority 1995).

Schools

Winnemucca has 3 elementary schools, 1 middle school, 1 junior high school, and 1 high school, with a total capacity in 1995 of 3,965 students. Total enrollment for the 1995-96 school year was 3,516 (89 percent of capacity). Enrollment increased 13.7 percent in the 2 years from 1993-94 to 1995-96. Several of the schools are nearing capacity, and modular classrooms are utilized to accommodate additional students, where necessary. The high school, in particular, is very close to capacity. The Humboldt County School District recently completed construction of a new physical education facility at the high school, as part of a 4-year expansion, which will eventually include administrative offices, a media center, cafeteria, and 10 classrooms. This expansion will increase the capacity of the high school from 1,000 to 1,200 students (BLM 1996).

The Pershing County School District has 1 elementary, 1 middle school, and 1 high school, all located in Lovelock, with an additional elementary located in Imlay. The total district enrollment in the fall of 1995 was 930 students (Tri-County Development Authority 1996b).

Law Enforcement and Fire Protection

Law enforcement in Humboldt County is provided by the Humboldt County Sheriff's Department, the Winnemucca Police Department, and the Nevada Highway Patrol. The Humboldt County Sheriff's Department provides police protection throughout Humboldt County. The sheriff's staff includes 20 deputies, 4 reservists, and 9 detention officers. In addition to law enforcement, the sheriff's department oversees the Humboldt County Detention Center, which has a current capacity of 61 inmates. The Winnemucca Police Department serves the City of Winnemucca, and additional areas, in cooperation with the Sheriff's Department, as necessary. The Winnemucca Police Department has a staff of 15 officers and 2 reservists. Currently the Department is in need of at least one additional officer to provide

adequate urban protection. Law enforcement in Pershing County is provided by the Pershing County Sheriff's Department, with 12 officers and 4 reservists, and the Lovelock Police Department, with 6 officers and 1 reservist (BLM 1996; Tri-County Development Authority 1996b; JBR Consultants, Inc. 1995).

Fire protection in the region is provided by local, state, and Federal agencies. The Winnemucca City Fire Department, with 24 volunteers, handles all fires within Winnemucca city limits. The Winnemucca Rural Fire Department, with 25 volunteers, is responsible for an area of 230 square miles around the town of Winnemucca, and has a mutual aid agreement with the BLM. The Lovelock Volunteer Fire Department has 25 firefighters (all emergency medical technicians), and 3 ambulances. The most common types of fires in the area are wildland fires. The Nevada Department of Forestry is equipped to fight wildland fires. It is directly responsible for fighting fires on state lands, and assists local and Federal agencies under mutual aid agreements. Both the U.S. Forest Service and BLM provide fire fighting capabilities on Federal lands (BLM 1996; Tri-County Development Authority 1996b; JBR Consultants, Inc. 1995).

<u>Medical Services</u>

Medical services in Humboldt County are provided by the Humboldt General Hospital, located in Winnemucca. The hospital has 22 acute care beds and 30 long-term care beds, and includes an intensive care unit and an obstetrics unit. Several renovations and additions were completed in 1995, including a Skilled Nursing Facility. The hospital also manages Community Health and Home Health offices. The medical staff includes 3 family practice staff, 1 general practice staff, 6 family physicians, 1 surgeon, 1 internist, 25 registered nurses, and 11 licensed practical nurses. In addition, specialists make routine visits to provide additional services. Emergency transportation services are provided by the Humboldt County Volunteer Ambulance Corps, under the jurisdiction of the hospital. In 1995, this emergency service was one of the busiest in the state, and an expansion of facilities was planned. Mental health services are provided by the Winnemucca Mental Health Center. Demand for services was high in 1995, with a 3- to 4-week waiting list; however, the opening of additional small offices in surrounding communities (Lovelock and Battle Mountain) was planned to alleviate some of the pressure. Winnemucca also has 5 dentists and 2 physical therapists (BLM 1996; Tri-County Development Authority 1996b; JBR Consultants, Inc. 1995).

Medical services in Pershing County are provided by the Pershing County Medical Center and Pershing General Hospital, both located in Lovelock. The Pershing County Medical Center provides routine exams and doctor visits; services visiting specialists; and contains offices for a dentist, optometrist, and pharmacy. Pershing General Hospital is a 9-bed acute care hospital and a 25-bed nursing home. The hospital has 2 physicians, 1 physician's assistant, 3 licensed practical nurses, and 4 full-time registered nurses. The facility provides an emergency room, volunteer ambulance service, and emergency helicopter flights to Reno (Tri-County Development Authority 1996b, 1997).

3.13.1.4 Government and Public Finance

<u>County and City Governments</u>

Both Humboldt and Pershing Counties utilize a commissioner form of government, each with three elected Commissioners. The counties administer many services, including fire protection, roads, recreational facilities, library, water supply, wastewater treatment, and planning for their respective jurisdictions. The county governments are primarily supported by ad valorem (property tax) and sales tax revenues. The counties also receive taxes on the net proceeds of mines, assessed at the same ad valorem rate as other property taxes within each respective taxing district. Net proceeds and property tax revenues provided for approximately 26 percent of Humboldt County total revenues in fiscal year 1994-95 and 32 percent of Pershing County total revenues in fiscal year 1993-94. Intergovernmental sources, which are primarily composed of sales tax revenues, provided approximately 61 percent of Humboldt County

revenues, and 46 percent of Pershing County revenues. The largest expenditures for Humboldt County are public safety, general governmental functions, public works, and the judiciary, comprising a combined total of 77 percent of total county expenditures in the 1994-95 fiscal year. These same expenditure categories comprised approximately 84 percent of Pershing County total expenditures in the 1993-94 fiscal year (Tri-County Development Authority 1995, 1996a).

The City of Winnemucca was incorporated in 1917. Lovelock was incorporated in 1919. Both cities operate by mayor-council forms of government. Administrative duties performed by these city governments include animal control, fire protection, golf course (Winnemucca), mosquito and weed abatement, police, prosecutor, public works, recreation, Regional City and County Planning Board, solid waste landfill, and street maintenance. Intergovernmental sources provided 61 percent of Winnemucca's total revenues in the 1994-95 fiscal year. Lovelock's primary revenue sources were charges for services (37 percent) and intergovernmental sources (30 percent) in the 1993-94 fiscal year. Property taxes provided 14 percent and 11 percent of total revenues, respectively, in Winnemucca and Lovelock. Approximately three quarters of city budget expenditures are allocated to public works and public safety in both Winnemucca and Lovelock (Tri-County Development Authority 1995, 1996a).

Tax Revenues

Property taxes are determined from the assessed valuation of properties and the ad valorem tax rate. The assessed valuation is 35 percent of the estimated full value of the property. Trends in assessed valuation and taxable sales for Humboldt and Pershing Counties are shown in Table 3-26. The total assessed valuation in Humboldt County in 1995 was $544,309,000, increasing and average of 5.8 percent per year in the previous 5 years. The total assessed valuation in Pershing County in 1995 was $150,157,000; this amount fluctuated in the previous five years, dipping to a low of $122,407,000 in 1993 and reaching a high of $152,190,000 in 1994. The ad valorem tax rate in Humboldt County ranged from $2.439 to $3.409 per $100 of assessed valuation in the 1994-95 fiscal year. The ad valorem tax rate in Pershing County ranged from $3.0876 to $3.6339 per $100 of assessed valuation in the 1994-95 fiscal year. Higher rates are assessed within cities than in other areas of the counties (Tri-County Development Authority 1995 and 1996a; Nevada Department of Administration 1996).

The assessed valuation of mining properties in Humboldt County was $161,335,000 in 1994, or approximately one third of the county's total assessed valuation (Table 3-26). This value increased substantially in the previous 4 years, averaging 21.7 percent annual growth. The assessed valuation of mining properties in Pershing County was $31,914,000 in 1994, or approximately 20 percent of the county's total assessed valuation. This value changed only slightly over the previous 4 years, averaging 2.2 percent annual growth. In addition to property taxes on real property, mines pay a net proceeds tax on minerals extracted. Net proceeds are calculated as the gross proceeds less allowable expenditures, and are taxed by the state's centrally assessed property tax division. This tax is currently $5 per $100 (if net is over $4 million). Counties receive revenues equal to their ad valorem rate where the mineral was produced, applied to the net proceeds, and the State of Nevada receives the balance. For example, in Pershing County, the ad valorem rate is $3.0876 per $100. Therefore, the county receives $3.09 for every $100 of net mining proceeds generated in the county. The state receives the balance of $1.91. Net proceeds taxes are distributed within counties the same way as other property taxes (Nevada Department of Administration 1996; BLM 1996).

Taxable sales increased steadily in Humboldt County from 1990 to 1994, averaging 8.5 percent growth per year. The 1994 taxable sales were $288,019,000. Pershing County's taxable sales increased an average of 12 percent per year from 1990 to 1993, and then dropped 24 percent to $39,644,000 in 1994. Sales tax rates in Humboldt and Pershing Counties in 1995 were 6.50 percent and 5.75 percent, respectively, with 2.0 percent accruing to the state. The remaining portions accrue to local school support, and county and city government (Nevada Department of

Table 3-26

Trends in Assessed Valuation and Taxable Sales - Humboldt and Pershing Counties

	1990	1991	1992	1993	1994	1995	Average Annual Increase
Humboldt County							
Taxable Sales	$215,026,000	$262,121,000	$256,092,000	$282,901,000	$288,019,000	---	8.5%
Assessed Valuation	$421,640,000	$453,726,000	$454,686,000	$474,371,000	$505,350,000	$544,309,000	5.8%
Assessed Valuation of Mining Properties	$86,376,000	$104,795,000	$136,335,000	$148,953,000	$161,335,000	---	21.7%
Pershing County							
Taxable Sales	$37,916,000	$42,685,000	$43,683,000	$51,932,000	$39,644,000	---	1.1%
Assessed Valuation	$147,664,000	$132,772,000	$131,110,000	$122,407,000	$152,190,000	$150,157,000	0.3%
Assessed Valuation of Mining Properties	$29,344,000	$29,580,000	$28,496,000	$28,302,000	$31,914,000	---	2.2%

Source: Tri-County Development Authority 1995, 1996a.

Administration 1996; Tri-County Development Authority 1995, 1996a; BLM 1996).

Mining directly contributes to local government revenues through property tax payments on mining property, net proceeds taxes, and sales taxes on local purchases. Additionally, revenues are contributed through employees' spending of wages, which generates sales taxes, and payments on personal property. Florida Canyon Mine has contributed to local government revenues in the above-described ways throughout its operational period. Direct contributions in 1996 are estimated at $507,279 in property taxes, $523,166 in net proceeds taxes, and $2,971,664 in sales taxes (within the state of Nevada) (Muir 1997). Indirectly, employees' spending of wages has generated sales taxes and personal property taxes. From the 1996 payroll of $14,889,024, it can be estimated that approximately 70 percent of employees' wages (or $10,422,316) is disposable income, with a substantial portion spent locally on goods and services. Applying an average sales tax rate of 6.25 percent, this yields a maximum of $652,645 in sales tax revenues. Property taxes and net proceeds taxes accrue to the state and to Pershing County. Sales taxes accrue to the state, Humboldt and Pershing Counties, and cities within the region. Other benefits are contributed by the mining industry through secondary economic activities and employment generated by mining activity.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action

The proposed project would provide for a construction phase of approximately 12 months, scheduled to begin in September 1997. Operations would continue for 5 years, through 2002. Reclamation would continue until 2010, with monitoring continuing for several years following reclamation. No increases in operations personnel are anticipated. An average construction work force of 43 would be employed over the 12-month construction phase, with a peak of 104 workers employed for a 2-month period approximately half way through the construction phase. In the case of most mining projects, discussion of social and economic impacts centers around the increases in employment and population and the associated impacts on housing, community services, and public finance. In the case of the proposed project, the primary impacts would be the temporary impacts of the new construction work force, the continuation of economic benefits provided by the operation of the Florida Canyon Mine, and the effects of eventual mine closure.

Given that no new operations work force would be expected, no permanent changes induced by the project are anticipated with respect to population, housing, schools, or public utilities and services. The new construction work force would temporarily impact the temporary and rental housing markets in local communities, but is not likely to induce noticeable changes in the level of public services available or required. These impacts would end when the construction phase is scheduled to end in 1998. The new employment in the construction phase would benefit local communities by providing new income and resulting increases in purchases and sales taxes in the area. The continued operation of the mine through the Proposed Action would provide for the on-going community benefits of employment, income, and tax revenues for the state and local counties and cities. The operations work force would be phased out over a 2-year period, beginning at the end of 2002, and a minimal work force would be maintained through the end of the reclamation period. With the phasing out of mine employment and the closure of the mine, income, tax revenues, and other economic benefits generated by mine operation would be discontinued.

As required by Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, the proposed project was evaluated for issues relating to the social, cultural, and economic well-being, and health of minorities and low income groups. Such issues are termed environmental justice issues, and none were identified for the proposed project. Social and economic impacts of the proposed project would not affect minority or low income groups disproportionately.

Population and Demography

Construction. During the construction phase, an average of 43 construction workers would be employed over a 12-month period, with a peak employment of just over 100 workers occurring in February and March 1998. Given the current mining activity in the area and the relatively low unemployment rates, it is expected that the local labor force available to fill these positions would be somewhat limited. Although some workers may become available as construction activities at other mines are completed, this is difficult to predict, and it must be assumed that not much local labor would be available. The assumption used in this analysis is that 15 percent of the work force would be hired from the local labor pool and 85 percent would relocate from other areas.

Based on previous EISs prepared for similar gold mining projects in northern Nevada, the non-local construction work force composition is estimated to be 90 percent single (including married individuals without family present) and 10 percent married with families. Married households are assumed to have 3.5 persons per household. The construction work force would vary over the 12-month period, temporarily raising or lowering the population levels in local communities, as construction tasks are initiated and completed. Anticipated new population during low, high, and average employment periods are shown in Table 3-27. During low employment months, population in local communities would be increased by 0 to 15 persons over current levels. During high employment months, local populations would be increased by as much as 108 persons. On average, over the 12-month construction period, the local population would be increased by 47 persons.

Additional population increases could be induced by the secondary economic activity generated through construction employment. In other words, the spending of workers' wages and purchases made by the mining company or contractors during the construction period would support additional jobs in other employment sectors. A standard multiplier of 1.2, from John Dobra's *The Economic Impacts of Nevada's Mineral Industry* (1989), is used to estimate this impact (0.2 secondary jobs for every one construction job). Using this multiplier, an average of 9, and a peak of 21 secondary positions would be generated by the proposed construction activity (Table 3-27). Approximately 70 percent of the indirect labor force is assumed to be supplied by second persons in direct labor households or by current residents of communities. Approximately 40 percent of in-migrating secondary workers are assumed to be single and 60 percent married (with 3.5 persons per married household). Using these assumptions, the remaining 30 percent of secondary positions to be filled by non-local workers would induce an average population influx of 8, and a peak of 16 persons. However, these positions would be temporary through the construction period and would not likely induce any permanent population changes.

The majority of the new population, from both direct and indirect employment, is expected to reside in Winnemucca, due to the availability of accommodations and services. This would temporarily increase Winnemucca's population by a maximum of 1 or 2 percent over the current population. Population changes in other communities would be negligible.

Operations. The operations work force would be maintained at approximately current levels through 2002. Therefore, no changes in local population are expected during this phase.

Reclamation. During the reclamation period, beginning in 2003, operations employment would be phased out. A minimal work force would be maintained for reclamation activities from 2003 through 2010, and for monitoring activities potentially through 2020. Population could begin to decline in the area beginning in 2003, if workers do not obtain work at other mines or in other suitable positions within a reasonable time period following lay-offs. The extent of the potential population changes are difficult to estimate, as it is highly dependent on the prevailing economic conditions and availability of work when employment is phased out.

Table 3-27

Employment and Population Increases During the Construction Phase

Direct Employment:

	Direct Employment	Non-Local	Non-Local Single	Non-Local Married	Total New Population
Low Employment Periods	1-14	1-12	1-11	0-1	1-15
High Employment Periods	104	88	80	8	108
Average Employment	43	37	33	4	47

Indirect Employment:

	Indirect Employment	Non-Local	Non-Local Single	Non-Local Married	Total New Population
Low Employment Periods	0-3	1	0	1	3
High Employment Periods	21	6	2	4	16
Average Employment	9	3	1	2	8

<u>Assumptions:</u>

Direct Employment:
- 85 percent of the direct labor work force is assumed to be non-local.
- The non-local direct work force is assumed to be 90 percent single and 10 percent married.
- An average of 3.5 persons per household is assumed for married workers.

Indirect Employment:
- Indirect employment is calculated at 0.2 indirect jobs for every direct job.
- 70 percent of indirect employment is assumed to be provided by second persons in direct households, or current community residents; 30 percent is provided by new non-local workers.
- The non-local indirect work force is assumed to be 40 percent single and 60 percent married.
- An average of 3.5 persons per household is assumed for married workers.

Economy, Employment, and Income

The principal economic effects of the Proposed Action would be a temporary increase in the construction employment in Pershing County and a continuation of the current mining operations employment at approximately current levels through the year 2002. New income would be generated from the new construction jobs, a significant portion of which would be spent in the local economy. Income from current mining operations positions would continue. Secondary jobs, primarily in the services and trade industries, would continue to be supported by mining employment in Humboldt and Pershing Counties. Additional secondary employment and income would be induced by the new construction positions. Employment and income would be phased out during reclamation.

Construction. The average of 43 direct construction jobs provided over the 12-month construction period would temporarily increase the construction sector employment in Pershing County by more than 170 percent over the 1995 figure. Total employment would increase 2.3 percent. Secondary employment induced by the project would average 9 positions over the year (using an employment multiplier of 1.2, as described the Population and Demography section above). This would be distributed between communities in Humboldt and Pershing Counties, with most positions likely to be concentrated in Winnemucca. This would represent a minor impact on total employment in Humboldt County. Unemployment rates in Humboldt and Pershing Counties may be slightly reduced by new direct and indirect employment generated by the proposed project.

The total payroll for the 12-month construction period is estimated at $1,873,802 (Muir 1997). Assuming that 70 percent of the payroll is disposable income, approximately $1,311,661 would be available for local spending on housing, food, clothing, entertainment, and savings. It is unlikely that all of this income would be spent locally, however, as most construction workers would relocate from other areas, and many would remain in the area for only a short period (i.e., a few weeks or months). Therefore, construction workers would be likely to spend portions of their earnings in other places. However, the portions that are spent locally would represent a positive economic benefit for the local economies. These benefits would be considered temporary in nature, as the increased direct income benefits would only occur during the 12-month construction period.

Operations. As the operations work force would continue at approximately current levels, the primary economic impacts associated with the proposed project would be the continuation of economic, employment, and income benefits generated by the Florida Canyon Mine. The anticipated employment through the operations and reclamation periods is shown in Table 3-28. The current operations employment of 328 positions provides approximately 48 percent of Pershing County mining employment, and 17 percent of total county non-agricultural employment. The operations work force would increase slightly through 1997, and then decrease by approximately 50 persons in 1998 to average 301 from 1998 through 2002. Using a multiplier of 0.74 ("Indirect Contributions of Mining", Section 3.13.1.2, Economy, Employment, and Income) estimated secondary employment of 223 positions would be supported by Florida Canyon Mine average operations employment. These would occur primarily in the services and trade sectors.

An average annual payroll of $16.8 million is estimated for the years 1998 through 2002, and includes $13.3 million for salaries and wages, $2.4 million for benefits, and $1.1 million for payroll taxes (Table 3-28). The projected average annual wage is approximately $40,000. The total payroll through the life of the project (through 2010) is estimated at $111.2 million. As described in Section 3.13.1.2, Economy, Employment, and Income, the total earnings generated through mining activity, as income cycles through the economy, can be estimated using a multiplier of 1.57 ($1.57 in total earnings within the state for every mining payroll dollar). Applying this multiplier to the total payroll and benefits paid through the life of the project ($104.2 million) yields estimated total earnings of $163.5 million within the state of Nevada. These earnings are generated by the respending of workers' income, and direct purchases of goods and services by

Table 3-28

Estimated Economic Contributions of the Florida Canyon Mine

Year	Employ-ment	Payroll	Benefits	Payroll Taxes	Total Payroll	Property Taxes	Net Proceeds Taxes	Sales Taxes	Purchases of Goods & Services in Nevada
1996	332	$14,889,024	$2,063,957	$1,191,122	$18,144,103	$507,279	$40,154	$2,971,664	$27,304,809
1997	356	$15,525,308	$2,794,555	$1,242,025	$19,561,888	$480,000	$0	$1,925,217	$26,203,829
1998	301	$13,315,516	$2,396,793	$1,065,241	$16,777,550	$480,000	$363,791	$1,940,198	$27,896,579
1999	301	$13,315,516	$2,396,793	$1,065,241	$16,777,550	$480,000	$363,791	$1,348,048	$18,907,829
2000	301	$13,315,516	$2,396,793	$1,065,241	$16,777,550	$480,000	$363,791	$1,367,223	$19,129,079
2001	301	$13,315,516	$2,396,793	$1,065,241	$16,777,550	$480,000	$363,791	$1,160,523	$16,744,079
2002	301	$13,315,516	$2,396,793	$1,065,241	$16,777,550	$480,000	$363,791	$1,108,848	$16,147,829
2003	9	$4,000,000	$680,000	$320,000	$5,000,000	$100,000	$166,000	$576,810	$6,810,000
2004	9	$450,000	$124,000	$36,000	$610,000	$20,000	$0	$30,000	$874,425
2005	9	$450,000	$124,000	$36,000	$610,000	$20,000	$0	$30,000	$845,925
2006	4	$215,000	$75,993	$17,200	$308,193	$20,000	$0	$30,000	$874,500
2007	4	$215,000	$75,993	$17,200	$308,193	$20,000	$0	$30,000	$994,500
2008	4	$215,000	$75,993	$17,200	$308,193	$20,000	$0	$30,000	$721,500
2009 to 2020[1]	--	$430,000	$151,986	$34,400	$616,386	$200,000	$0	$100,000	$8,786,325
TOTAL[2]	--	$88,077,888	$16,086,484	$7,046,231	$111,210,603	$3,280,000	$1,984,955	$9,676,865	$144,943,400

[1]Reclamation would continue through 2010, followed by several years of monitoring activities, potentially continuing through 2020.

[2]1997 to 2020.

Source: Muir 1997.

the mining company, both of which support secondary businesses and industries within the economy. Total purchases made by Florida Canyon Mine through the life of the mine are estimated at $193.2 million (Table 3-28), with approximately 75 percent of these purchases ($145 million) made within the state of Nevada.

Reclamation. Mine closure in 2002 would cause a reduction in Pershing County total employment and a substantial reduction in mining sector employment. Unemployment could temporarily increase, depending upon the amount and types of available work at the time of closure. The loss of mining employment in the county would represent a net income loss, as mining jobs typically pay the highest wages of any employment sector. The earnings generated by mining employment and the secondary effects of spending by workers and purchases of goods and services would be reduced through the reclamation period, and eventually terminate when all employment and mining activity cease.

<u>Housing</u>

Construction. Demand for housing would increase during this phase, as non-local construction workers enter the area and seek accommodations for the duration of their work assignments. In addition, positions for secondary workers in the local communities also would generate a small influx of people, which would increase the housing demand slightly. The level of increased housing demand, as shown in Table 3-29, would vary depending upon the number of construction workers needed at the Florida Canyon Mine at any particular time, and the number of workers who choose to share housing. All married workers were counted as a single household. Single workers were assumed to share housing at a rate of approximately 1.3 persons per household. During low employment periods, the increased demand from both direct and indirect households is estimated to be equivalent to 2 to 10 new households. During peak employment periods (when 100 or more workers are needed at the mine), there would be approximately 76 new households. The average over the 12-month period would be an increase of 32 new households in the area.

Only a small number of construction workers would be employed for the entire 12-month duration. Most would be employed for periods of a few weeks to a few months. Therefore, it is expected that most workers would seek hotel/motel or recreational vehicle accommodations, with only a very few workers seeking short-term rentals of other housing types. During low employment periods, and for the average of the period, this would not impact local housing markets noticeably, depending upon the season. (Higher impacts would occur in the summer, when tourism is at its peak and vacancy rates are low.) During peak employment periods, and during the tourist season, the impact on the temporary housing markets would be more marked.

Most temporary housing would likely be supplied by the community of Winnemucca, given the local availability of accommodations. Winnemucca has an estimated 1,600 hotel/motel rooms, with at least a third available for rental by the week. The local supply and vacancy rates are sufficient to accommodate temporary construction workers, even during peak periods, provided that peak construction periods do not occur during the summer months. Given the current construction schedule, this should not be a problem. The availability of rentals in the area is extremely limited. Those who seek rental-type housing would likely have difficulty finding such accommodations and would add to the existing strain in area rental markets.

The cost of housing would be reasonably affordable for construction workers. With an estimated monthly salary of $2,500, and assuming that 25 percent of monthly wages would be spent on housing, the average construction worker could afford a gross housing cost of $625 per month. This is competitive with local housing markets. The increased housing demand generated by new households in the area could have a slight impact on housing costs, but this is not likely to be noticeable and would be temporary in nature.

Operations. No changes in housing demand are anticipated for the operations phase of the project, as there would be no new operations personnel employed. Housing demand due to

Table 3-29

New Households - Construction Phase

	Direct Labor		Indirect Labor		Total New Households
	Non-Local Workers	New Households[1]	Non-Local Workers	New Households[1]	
Low Employment Periods - Single	1-11	1-8	0	0	1-8
Married	0-1	0-1	1	1	1-2
TOTAL	**1-12**	**1-9**	**1**	**1**	**2-10**
High Employment Periods - Single	80	62	2	2	64
Married	8	8	4	4	12
TOTAL	**88**	**70**	**6**	**6**	**76**
Average Employment - Single	33	25	1	1	26
Married	4	4	2	2	6
TOTAL	**37**	**29**	**3**	**3**	**32**

[1]1.3 persons per household is assumed for single workers.

the proposed project would remain roughly the same as current demand.

Reclamation. Housing demand in the area could potentially decrease at the end of mine life. The extent of this decrease would depend upon how many workers locate alternate work following lay-offs and choose to remain in the area. If workers leave the area, housing demand would decrease, vacancy rates could increase, and housing costs in the area could decrease slightly. This would impact primarily Winnemucca, as 65 percent of current Florida Canyon Mine employees reside there. Lovelock and Imlay, with 21 percent and 9 percent, of current employees, respectively also could be impacted. Housing markets in other local communities would be affected only slightly.

Community Services

Construction. Water supply, wastewater treatment, and solid waste disposal systems would not be noticeably impacted by the proposed project. The temporary additional population in the area would increase the demand for these services only slightly above current levels, and no significant changes in service delivery would occur.

Schools would not be noticeably impacted by the proposed project. Through the 12-month period, an average of 4 married workers would in-migrate to the area. Each of these households is assumed to have an average of 2 adults and 1.5 children, only 70 percent of whom would be school-aged. At this rate, an average of 6 school-aged children would enter local communities over the 12-month construction period, as a result of both direct and indirect employment. At peak periods, an average of 13 school-aged children may be present. Even if all of these children located in Winnemucca, local schools could accommodate the additional students. Due to the temporary nature of the work periods for construction workers, it is likely that many of the children may not even enroll in local schools, but would be home-schooled.

The proposed project could potentially cause slight temporary increases in local law enforcement needs. The influx of temporary workers could have a disproportionate effect on local law enforcement workloads. On average, over the 12-month period, this effect would not likely be noticeable; however, during peak employment periods, there could be a slight impact on local law enforcement agencies. This would most likely occur in Winnemucca, and would be a negative impact, given that the Winnemucca Police Department is already considered short-staffed by one officer. Fire protection services would not be noticeably impacted. Construction-related population increases would temporarily increase demands for medical services (primarily in Winnemucca). However, the increases would be minimal, and current services are adequate to serve additional demand.

Operations. No impacts to community services would occur during the operations phase of the proposed project. Demand for services would continue at current levels.

Reclamation. Demand for services could decrease during the reclamation period, depending on the number of workers who leave the area following lay-offs. The effects would be proportionate with the number of workers and their families who leave. If a large number leave the area, effects would be noticeable in Winnemucca, Lovelock, and Imlay. As workers leave the area, demand for utilities, law enforcement, fire protection, and medical services would decrease. This would be beneficial in reducing demand loads where systems of delivery are strained. It would be detrimental where additional demand supports the facility, such as a hospital. The number of school-aged children also would decrease, leading to more space in local schools. A negative impact of reduced population is that it decreases the tax base, which goes toward supporting public services and funding capital improvements.

Government and Public Finance

The primary impacts of the proposed project on public finance would be the one-time benefits of increased sales taxes during the construction period, the continuation of economic contributions provided by on-going operation of

the mine, and the loss of tax revenues following mine closure.

Construction. During the construction phase, additional sales taxes would be generated in the area from employees' spending of wages and contractors' purchases of goods and services. If $1,311,661 of the total payroll during the period is disposable income, and an estimated 75 percent of this is spent locally, approximately $61,500 could be generated in sales taxes (assuming an average sales tax rate of 6.25 percent). Sales taxes provide substantial revenues for both counties and cities, and portions also accrue to the state of Nevada. Indirect sales tax revenues would be greater than the direct amount as income cycles through the economy (i.e., money is respent on goods and services).

Operations. Continued operation of the Florida Canyon Mine would provide for the on-going benefits of property tax, net proceeds tax, and sales tax revenues for Pershing County, Humboldt County, and local city governments. Estimated tax contributions through the life of the project are shown in Table 3-28. Estimated property tax payments are $480,000 per year from 1997 through 2002. Total property tax contributions through the life of the project (1997 through the end of reclamation and monitoring) are estimated at $3,280,000. Property taxes would accrue to Pershing County. Mining currently provides a substantial tax base for Pershing County, of which the Florida Canyon Mine is a primary part. Mining properties currently provide for approximately 20 percent of total assessed valuation in Pershing County. The assessed valuation of properties in the county has changed very little in since 1990, indicating that the tax base has remained essentially the same. Continued operation of the mines located in the county would provide stability in the tax base.

Net proceeds taxes also contribute significantly to county revenues. Together, net proceeds taxes and property taxes provide approximately 30 to 35 percent of Pershing County revenues. Continued operation of the mine would continue this revenue source for the county. Projected net proceeds contributions from Florida Canyon Mine are $363,791 per year from 1998 through 2002, and a total of $1,984,955 through the life of the project. Portions of the net proceeds taxes would accrue to the state of Nevada.

Sales taxes would continue to accrue from workers' spending of wages in the local economy, and the mine's purchases of goods and services. Projected sales tax payments by the mine within the state of Nevada from 1997 through the end of the reclamation and monitoring period total $9,676,865. Projected payroll salaries and wages are $13,315,516 per year from 1998 through 2002, and $87,647,888 for the life of the project. If 70 percent of this is disposable income spent locally on goods and services, direct sales taxes of a maximum of $582,600 per year, or $3,834,600 total, would result (utilizing a sales tax of 6.25 percent). Sales taxes provide revenues for the state, counties, and cities. Cities, in particular, are highly dependent upon sales tax revenues. A large portion of the sales tax revenues resulting from spending of payroll income would occur in the community of Winnemucca, where most of the workers live and, therefore, spend their income. In addition, the continued support of commercial and residential activity in Winnemucca and other local communities would continue to contribute to the tax base and provide property taxes for local cities and counties.

Reclamation. Beginning in 2003, with mine closure, tax revenues from the Florida Canyon Mine would begin to decrease substantially. Pershing County would experience significant reductions in property tax and net proceeds tax revenues. This could cause budget constraints and necessitate finding alternate sources of revenues or altering county budget expenditures. Sales tax revenues would decrease for Humboldt and Pershing Counties, Winnemucca, Lovelock, and other local communities. The loss of these revenues would have negative impacts on local government entities.

3.13.2.2 North Extension of the Heap Leach Pad Alternative

The social and economic impacts of this alternative would be the same as those described for the Proposed Action.

3.13.2.3 No Action Alternative

Under the No Action Alternative, mine operations would cease in late 1997. This would result in adverse social and economic impacts in the form of lost employment, personal income, tax revenue, and other economic benefits contributed by the Florida Canyon Mine. The current employment of 328 operations workers would be discontinued, causing a loss of direct and indirect employment and income benefits in the local economy. A minimal staff would be maintained through the reclamation period. With mine closure, tax revenues would no longer be accrued from the mine, including property taxes, net proceeds taxes, and sales taxes. This would adversely impact the Pershing County and Humboldt County governments, the cities of Winnemucca and Lovelock, and the local school districts, resulting in a loss of funding, and temporarily causing some budget constraints. Purchases of goods and services in the local economy would be reduced, and eventually discontinued. The future economic benefits of mine operation (shown in Table 3-28) would not be obtained.

Workers would likely attempt to acquire work at other mines in the area, depending on the jobs available at that time. Unemployment rates would likely increase temporarily. If jobs were unavailable, the unemployed workers would either remain in the area, continuing their demands on community services, or would relocate to another area for employment. If many workers were forced to relocate, there would be a decrease in local populations, and an associated loss of economic activity, sales taxes, and reduced demand for housing and community services.

3.13.3 Cumulative Impacts

The cumulative assessment area encompasses those counties and communities wherein the social and economic impacts from regional development would be expected to occur. Given geographical and demographic characteristics, impacts from the Proposed Action would occur in Pershing County, Humboldt County, Winnemucca, Lovelock, and to a less extent, other small communities near the mine site. These areas define the socioeconomics cumulative assessment area for the project.

Socioeconomic impacts resulting from reasonably foreseeable future actions would depend on the schedule and scope of potential new mining activities and any other large-scale development projects. Continued mining operations and expansions, in particular, may extend the types of beneficial and negative impacts similar to those described for the proposed project. In addition, the timing of mine closures also could compound the effects of mine shut-downs. The current major mining projects and reasonably foreseeable future projects, with their estimated employment numbers and shut-down dates are listed in Table 1-4 and illustrated on Map 1-4.

The cumulative assessment area has long been dependent on the mining sector for economic activity and employment. Likewise, it is the mining sector that has done much to define this region. Rapid growth over the last 15 years is largely attributable to the increased mining in the area. Cumulative impacts from mining, therefore, are not a new phenomena. The impacts include a substantial infusion of economic resources, which has been beneficial. Mining has contributed substantially to the regional economic base, providing jobs, high wages, tax revenues, and indirect economic benefits. This has fueled economic expansion and helped to provide capital for infrastructure development in local communities, a foundation for further economic growth (BLM 1996; Nevada Bureau of Mines and Geology 1991).

However, with the population growth attributable to mining, development pressures also have become apparent. Past cumulative impacts have resulted in a limited housing market, increased crowding in schools, and excess demand on some community facilities and services. The actual impacts experienced in an area largely depend on the relationship between the amount and timing of the housing or service demand, and the timing of the construction activity and tax revenues available that could fund the needed capital improvements or services expansions. Housing construction is often slow to respond to increased demand, sometimes with a lag time of several years between the initial demand,

construction, and availability of additional housing units. In addition, the increased demand must be perceived as long-lasting for the developers to respond with additional construction. In the realm of public services, new projects can produce public revenue surpluses, but there is an initial lag of 1 to 2 years before the revenues are available for needed expenditures. Therefore, local governments may temporarily experience deficits.

Several issues have been identified in the cumulative assessment area, with respect to local housing markets and public services that could be compounded by any increases in population induced by the reasonably foreseeable future actions. Specifically, 1) temporary housing markets could be further impacted by increased mining activity, 2) current shortages exist in the local rental housing market, 3) law enforcement services in the area are currently short-staffed, and 4) many of the area schools are at or near capacity. The three reasonably forseeable future actions identified on the list, the Relief Canyon Mine expansion, and the new Trenton Canyon Mine and Goldbanks Mine, could further impact these resources by bringing new population to the area for construction and operations work forces. No definite schedules currently exist, so it is difficult to predict the extent of the cumulative impacts, if any.

The required work force for the Relief Canyon Mine is undetermined. The Trenton Canyon Mine would require 130 operations personnel and an undetermined construction work force. Goldbanks Mine would require 200 to 250 construction personnel and 284 operations personnel. If these projects induce population increases at the same time that the Florida Canyon Mine is employing its construction work force, additional impacts to local temporary and rental housing markets and increased pressure on local law enforcement services and schools could occur. Or if construction periods are timed sequentially, employment shifts from one project to another could extend the duration of the impacts. Additional impacts on the temporary housing market would increase the competition with tourists for hotel/motel rooms, recreational vehicle sites, and camping areas. Increased demands on local law enforcement agencies would reduce service levels for the current population and increase the pressure for additional funding for services. Increased school enrollments would require additional expenditures by local school districts and increase the pressure for new infrastructure in facilities that are reaching capacity.

Positive benefits also would be contributed by the cumulative mining projects. Relief Canyon Mine and the proposed Goldbanks Mine are both located in Pershing County. These projects would add to the mining employment and income in Pershing County and contribute to the tax base. These benefits would continue through the life of the mines. In addition, sales tax revenues would be further increased in local communities where workers reside (primarily Winnemucca and Lovelock).

Both present actions and reasonably foreseeable future actions can contribute to the scale of the impacts resulting from mine closure. The shut-down dates listed in Table 3-1 provide an estimate of potential mine closures; however, these dates are highly subject to change as mines continue exploration and expansion activity, which can extend the mine life. If several mines in the cumulative assessment area close simultaneously or within a relatively short period of time from each other, the negative effects of unemployment, loss of income, decreasing population, and loss of tax base can be compounded. Given the shut-down dates listed, there is potential for these type of cumulative assessment with several area mines, including Lewis & Crofoot, Relief Canyon Mine, and Marigold Mine (all scheduled to close within a 2-year time period). In addition, the Rosebud Mine, Trenton Canyon Mine, and Lone Tree Mine could contribute to these impacts in subsequent years. These cumulative impacts are speculative, however, given the high variability in mine lifetimes. In addition, prevailing economic conditions at the time, and the start-up of other mines have the potential to off-set these impacts.

3.13.4 Potential Mitigation and Monitoring

No mitigation and monitoring measures are recommended for social and economic resources. No significant impacts were identified for project

construction and operation. The impacts associated with mine closure are largely unavoidable. A minor impact was identified for the effects on the local temporary housing markets during the construction period, especially during the 2 months of peak employment. However, no specific mitigation measures are proposed because the BLM is without legal authority to compel or enforce private or community action in regard to housing or other local community resources.

The BLM can and does encourage local, county, and state governments or agencies to initiate discussions with the project proponent on the basis of the analysis presented in this EIS. The establishment of a dialogue based on mutual advantage and understanding, and a commitment to a shared responsibility for resolution of the potential impacts associated with project development, could lead to the preparation and implementation of mitigation measures which are advantageous to all parties.

3.13.5 Residual Adverse Impacts

Residual adverse impacts to housing and community services would be minor and short-term. The impacts associated with mine closure are largely unavoidable. The extent of these impacts would depend upon other economic activities in Pershing and Humboldt Counties, the development of the tax base, and prevailing economic conditions at the time of mine closure.

3.14 Cultural Resources, Ethnography, and Paleontology

3.14.1 Affected Environment

3.14.1.1 Cultural Resources

The goal of cultural resource management is to maintain and enhance historic and prehistoric cultural resource values. Cultural heritage resources consist of prehistoric and historic archaeological deposits; structures of historic or architectural importance; and Native American traditional ceremonial, ethnographic, religious and burial sites. Prehistoric resources are physical locations with a cluster of features and/or artifacts that are a result of human activities occurring prior to written records. Historic resources are clusters of features and/or artifacts left by human activity occurring after written records were common.

Prehistoric site types found in the project area include lithic scatters, rock shelters, temporary camps, and isolated finds. Historic cultural resources in the project area are primarily related to mining and include habitation sites, trash middens, campsites, mine workings, and mine townsites.

Analysis of cultural resources can provide valuable information on the cultural heritage of local peoples and regional populations. Cultural heritage resources are nonrenewable resources that are afforded protection by Federal, state, and local laws, ordinances, and guidelines. The Antiquities Act of 1906 and the following Federal legislation, policies, regulations, and guidelines have been enacted to protect cultural heritage resources and have been considered during review of the proposed project:

- The Antiquities Act of 1906 (PL 59-209) and the Archaeological Resources Protection Act of 1979 (PL-96-95).
- National Historic Preservation Act of 1966, as amended; Section 106 Compliance; 16 United States Code 470 et seq., and implementing regulations 36 CFR 800.
- American Indian Religious Freedom Act of 1978 (AIRFA).
- Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).

<u>Cultural Setting</u>

The earliest human occupation of the Humboldt Basin area has been identified as occurring during the time period known as the pre-Archaic (approximately 7,000 to 12,000 Before Present [B.P.]). Information for this time period is limited, however, but information suggests that the groups were small, very mobile, and may have relied on hunting in an environmental setting that was wetter and cooler than the present climate. In the vicinity of the project area, a fragment of a fluted projectile point, known as the Clovis-Llano type and indicative of the pre-Archaic time period, was found at Rye Patch Reservoir, approximately 2 miles west of the Florida Canyon Mine. Large lanceolate stemmed projectile point types from slightly later in the pre-Archaic time frame also have been found in the Rye Patch Reservoir locality (Skinner 1996; BLM 1996b).

The beginning of the Archaic period (approximately 7,000 B.P. to the time of contact with Euroamericans) coincided with the onset of a warming and drying period in the region. Early Archaic period sites tend to be found in valley bottoms near permanent water sources and indicate seasonal occupation. Human populations in the vicinity of the proposed project may have been sparse during this time period. During the Middle Archaic (3,500 to 1,500 B.P.), regional human adaption to the climatic changes included a broadening of exploitation of the resource base and establishment of semi-permanent seasonal habitations within a home range. A number of habitation sites at Rye Patch Reservoir show evidence of having been occupied throughout each season, although perhaps neither continuously or by the same groups. The lack of village sites with large pit houses in the Rye Patch area may indicate that the area was used merely as part of the seasonal

rounds made by a group of people centered either to the north or south of the area. During the Middle Archaic, use of upland settings appears to have increased and sites found in these areas are generally associated with resource procurement activities and forays (hunting, plant gathering and processing and wood gathering). The late Archaic (1,500 B.P. to the historic period) was marked by the introduction of the bow and arrow and a continued use of a wide variety of ecozones and food sources. Pottery and horticulture were not developed in the area, instead populations made seasonal rounds relying on a great variety of fauna and flora with the emphasis changing from riverine to desert species. Sites at Rye Patch Reservoir indicate that rabbits were highly utilized (Skinner 1996; Miller et al. 1996).

The first major contact between Euroamericans and the local native populations occurred in 1828, when Peter Skene Ogden, leader of a Hudson's Bay Fur Company trapping party, entered the study area. He trapped beaver just above modern-day Winnemucca and then proceeded downstream on the Humboldt River to the vicinity of Mill City, located north of the project area. Ogden made two more expeditions through the area in 1829 and produced a map of the Humboldt Basin. During the second expedition, his group encountered a large band of Native Americans in the area (Skinner 1996).

Settlers bound for Oregon and California followed the trappers along the Humboldt River, beginning with the Bidwell-Bartleson party in 1841 who negotiated the route that would become known as the California Emigrant Trail. The California Gold Rush saw some 197,600 emigrants and their livestock using the California Emigrant Trail between 1849 and 1860. The main track of the trail traversed the bench above the west bank of the Humboldt River from Rose Creek to the Lovelock sloughs. The east bank of the Humboldt also was threaded by a branch of the trail and crossed approximately 1 mile west of the project area in Section 33. Use of the trail decreased in the mid 1870s with the advent of low-fare passage on the transcontinental railroad (Skinner 1996; Miller et al. 1996).

In 1860, gold was discovered in the Humboldt Mountains and within 1 year Humboldt City, located immediately north/northeast of the project area, was founded. By 1863 the town had a population of 500. The area's workings were consolidated by Atlantic and Pacific Gold and Silver Company in early 1864, including three mines in the area, the Calaveras, Starlight and Sigel Mines, which were operating day and night. By 1865, the mines' production had slackened and the town and workings were being abandoned. By 1869, none of the mines was producing. Mines in the area were reworked marginally in 1871, but were quickly abandoned. After 1869, Humboldt City basically became a ghost town (Skinner 1996).

In the summer of 1868, work on the Central Pacific Railroad was initiated in the vicinity of the project area. The Central Pacific founded the Humboldt House, historically located immediately north/northwest of the proposed project, as a eating station for rail passengers. The house also served as a shipping station for mines in the area. Dining cars were added to trains in the 1890s, eliminating the need for eating stops. Thereafter, the Humboldt House served mainly as an inn and restaurant for state travelers. As automobile traffic became more prevalent, the Humboldt House catered to the automobile travelers' needs. In the 1920s, it was moved closer to the highway to accommodate motor travelers. In 1962, it was demolished to make room for I-80 (Skinner 1996; Miller et al. 1996).

Little activity occurred in the Imlay Mining District between 1870 and 1900; however, with the discovery of gold in other areas in Nevada, interest in gold in the Imlay Mining District was rekindled. Starting in 1903, a second boom occurred in the area, although by 1919 and the end of World War I, activity was again in decline. A third boom occurred during the Depression, during which time the workings that would become the modern day Florida Canyon Mine were developed. Fluorspar mines, including the Piedmont Mine, also were developed during the 1930s in the area. The Florida Canyon Gold Mine, abandoned shortly after its initial development, was reopened in 1986 by the Pegasus Gold Corporation (Skinner 1996).

Construction of Rye Patch Reservoir, located west of the project area, was begun in 1935 to provide water for irrigation and delivered its first stored water in 1941. The Pitt-Taylor Reservoir, located east of Rye Patch Reservoir, became an additional storage reservoir in 1945.

3.14.1.2 Cultural Resources Identified in the Project Area

Maps 3-25 and 3-26 illustrate the Area of Potential Effect (APE) and the cumulative assessment area for cultural resources under the Proposed Action. The APE generally includes a checkerboard of Federal and private lands that existing Florida Canyon Mine facilities would expand onto. The cumulative assessment area is bounded by the proposed mine permit expansion boundary and also includes the water supply pipeline ROW from Rye Patch Reservoir to the mine site (Map 3-26).

The entire APE has been inventoried to Class III standards for those areas not lying on 25° slopes or greater and to Class II standards on areas of 25° slopes or greater, with BLM and SHPO approval (McGuckian 1993a,b; Cribley 1995).

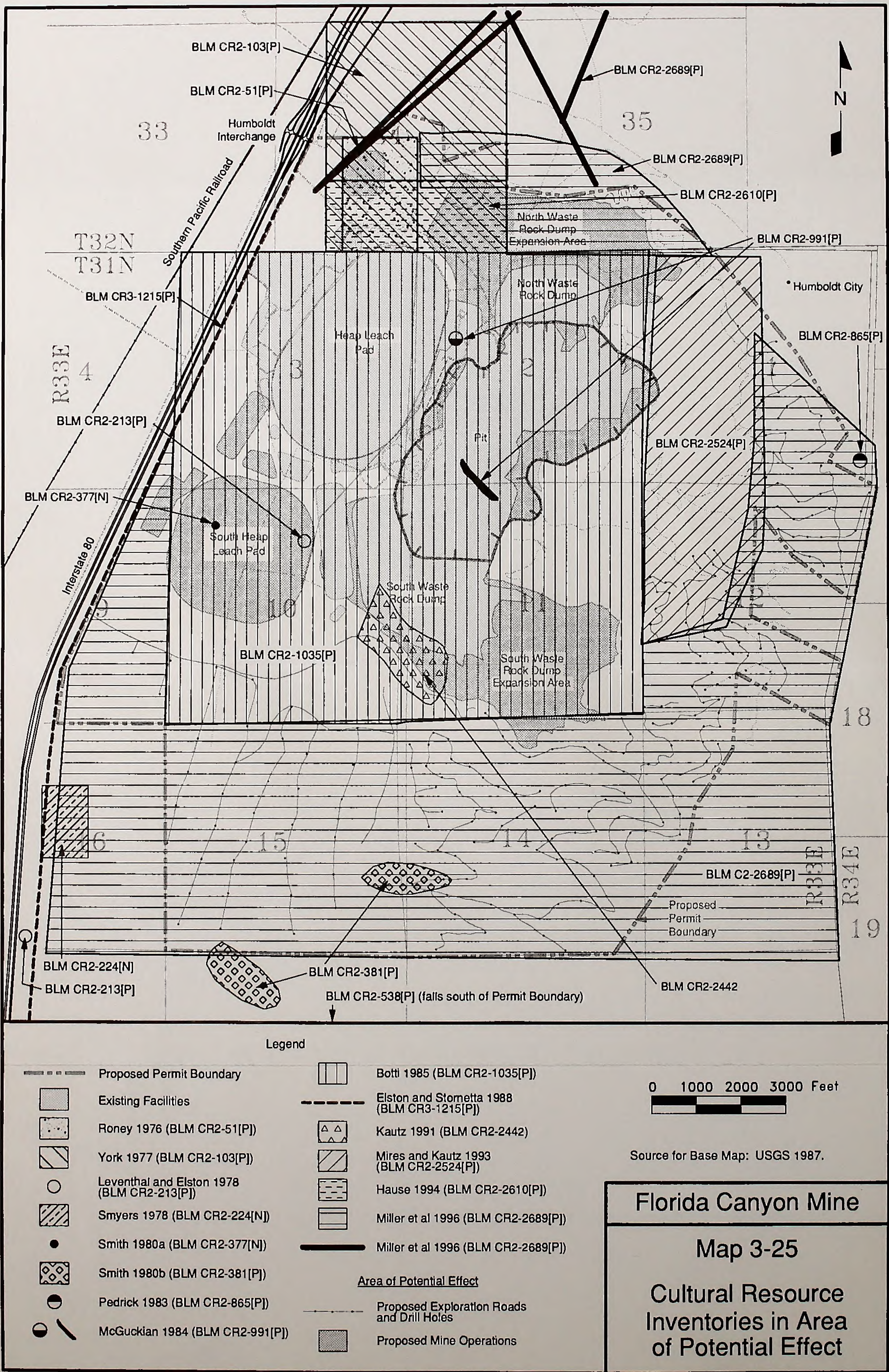
Maps 3-25 and 3-26 depict the location of 16 cultural resource inventories that have occurred in areas associated with the APE, the cumulative assessment area, or areas that lie within 500 feet of the APE but outside of the cumulative assessment area. Summaries of surveys conducted and sites identified are presented in Tables 3-30, 3-31, and 3-32. These inventories that detail the results of the intensive archaeological evaluations conducted as part of this proposed project are on file at the BLM office in Winnemucca, Nevada. Only brief summaries and general location descriptions have been provided in the EIS to protect the confidentiality of the sites. Discussions concerning sites adjacent to the APE are included here because of the potential for the Proposed Actions to create indirect effects on these sites.

The first inventory conducted in the APE was by Roney in 1976 (BLM Report CR2-51[P]) as part of a borrow area project planned in the vicinity of a proposed sediment pond. No sites were identified within the project area, although one site, (CrNV-22-232) associated with the Humboldt House was located within 500 feet of the APE (Roney 1976). This site was determined ineligible to the Register (James 1996). Additional inventories by York (1977), Smyers (1978), Leventhal and Elston (1978), Pedrick (1983), and Hause (1994) also did not identify any cultural sites within the APE or cumulative assessment area. These surveys were documented in projects CR2-103(P), CR2-224(N), CR2-213(P), CR2-865(P), and CR2-2610(P), respectively, and covered areas associated with geothermal and drill site lease operations, proposed road blading, and a proposed 145-acre expansion area within and adjacent to the APE and the cumulative assessment area (Table 3-31). York (1977) did identify three sites within 500 feet of the APE (CrNV-22-232, CrNV-02-388, CrNV-02-408).

Three inventories (CR2-377[N], CR2-381[P], CR2-538[P]) conducted by Smith (1980a, 1980b, and 1981) for operations associated with drilling lease and horse trap clearances and an inventory of the Freeport Mining operation located one site (CrNV-02-2275) within the APE and one site within 500 feet of the APE and within the cumulative assessment area (CrNV-02-2645). Site CrNV-02-2275, identified as a lithic scatter, was found ineligible to the NRHP (James 1996). Final SHPO concurrence has not yet been received on Site CrNV-02-2645 located within the cumulative assessment area (Table 3-31).

McGuckian (1984) surveyed a portion of the APE as part of an inventory for a proposed leach pad. The survey, documented in BLM Report #CR2-991(P), identified one isolate (CrNV-02-3260) and no sites.

A 2,560-acre inventory (CR2-1035[P]) conducted by Botti (1985) as part of a proposed expansion of the Florida Canyon mining operations identified several sites located within the APE and the cumulative assessment area. Botti also identified numerous isolates within the assessment area (CrNV-02-3341, -3343, -3346, -3347, -3349, -3351, -3352, -3354). Sites located within the APE included CrNV-22-3344, -3345, -3348 (a historic mining site), and -3350. Sites CrNV-02-3345 and



Florida Canyon Mine

Map 3-25

Cultural Resource Inventories in Area of Potential Effect

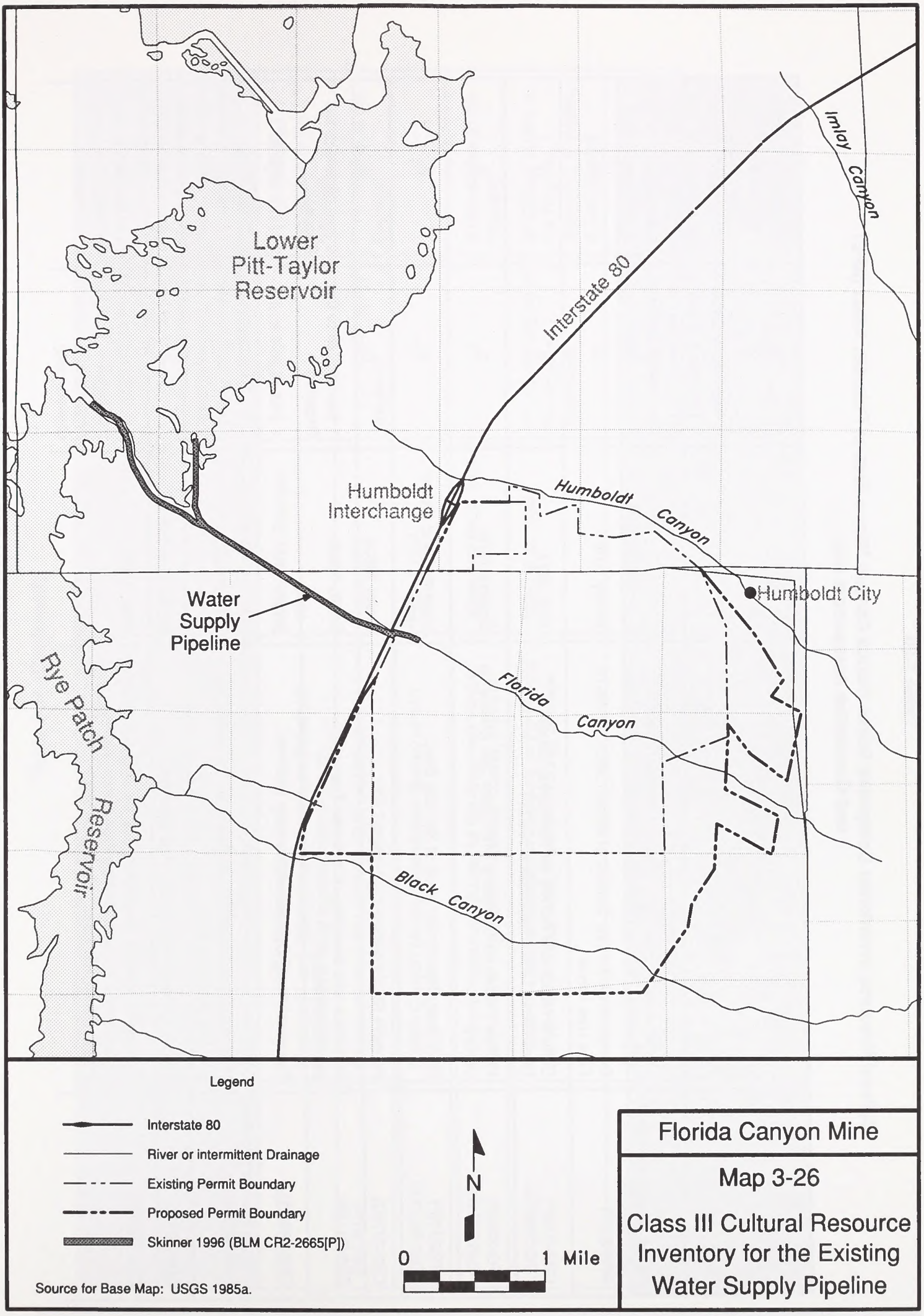

Lower
Pitt-Taylor
Reservoir
Interstate 80
Imlay Canyon
Humboldt
Interchange
Humboldt Canyon
Humboldt City
Water
Supply
Pipeline
Florida Canyon
Rye Patch Reservoir
Black Canyon
Legend
Interstate 80
River or intermittent Drainage
Existing Permit Boundary
Proposed Permit Boundary
Skinner 1996 (BLM CR2-2665[P])
Source for Base Map: USGS 1985a.
N
0
1 Mile
Florida Canyon Mine
Map 3-26
Class III Cultural Resource
Inventory for the Existing
Water Supply Pipeline

Table 3-30

Cultural Resource Inventories Completed Within Florida Canyon Mine's Area of Potential Effect (APE) and Cumulative Assessment Area

BLM Report Number	Report Title	Reference	Number of Sites Recorded in the APE (Sites may be Duplicated between Inventories)	Number of Sites Recorded in the Cumulative Assessment Area or Adjacent to the APE (Sites may be Duplicated between Inventories)
CR2-51(P)	Borrow Area Survey, Bureau of Reclamation NV-16-76 Free Use Permit	Roney 1976	0	0
CR2-103(P)	Cultural Resources Survey for Humboldt House, Geothermal Lease Application N-8711	York 1977	0	0
CR2-224(N)	Phillips Petroleum Company Drill Lease Site Clearance Survey	Smyers 1978	0	0
CR2-213(P)	Preliminary Reconnaissance of Six Drill Sites	Leventhal and Elston 1978	0	0
CR2-377(N)	Phillips Lease Clearance (N10865)	Smith 1980a	0	0
CR2-381(P)	Clearance and Inventory of a Horse Trap near Humboldt House	Smith 1980b	1 (not eligible to the Register)	1 (not eligible to the Register)
CR2-538(P)	Freeport Mining Operation Inventory	Smith 1981	1 (not eligible to the Register)	2 (1 not eligible, 1 unevaluated)
CR2-865(P)	Florida Canyon Mine Plan of Operation Road Blading and Drill Site Inventory	Pedrick 1983	0	0
CR2-991(P)	Florida Canyon Mine Leach Pad Inventory	McGuckian 1984	0	0
CR2-1035(P)	Cultural Resources Reconnissance for Pegasus Gold Corporation Proposed Mining Operations, Florida Canyon Area, Pershing County, Nevada	Botti 1985	4 (2 not eligible to the Register, 1 destroyed, 1 unevaluated)	6 (2 not eligible, 1 destroyed, 3 unevaluated)

Table 3-30 (Continued)

BLM Report Number	Report Title	Reference	Number of Sites Recorded in the APE (Sites may be Duplicated between Inventories)	Number of Sites Recorded in the Cumulative Assessment Area or Adjacent to the APE (Sites may be Duplicated between Inventories)
CR2-2239(P)	An Archaeological Reconnaissance Between Wadsworth and Winnemuca, Nevada on Behalf of Nevada Bell's Rural Improvement Program	Elston and Stornetta 1988	0	2 (1 unevaluated, 1 not eligible to the Register)
CR2-2442	Re-evaluation of Site CrNV22-3345 as part of 1991 Florida Canyon Mine Amendment EA	Kautz 1991	1 (not eligible to the Register)	1 (not eligible to the Register)
CR2-2610(P)	Florida Canyon Mining Amendment Survey of 145 Acres	Hause 1994	0	0
CR2-2524(P)	A Cultural Resources Survey of the Proposed Florida Canyon Mine Expansion, Pershing County, Nevada	Mires and Kautz 1993	0	3 (not eligible to the Register)
Cr2-2689(P)	A Class III Cultural Resources Inventory of the Florida Canyon Mine Study Area, Pershing County, Nevada	Miller et al. 1996	11 (10 not eligible to the Register, 1 destroyed)	35 (23 not eligible to the Register, 1 destroyed, 8 eligible, 3 unevaluated)
CR2-2665(P)	A Class III Cultural Resources Inventory of the Florida Canyon Mine Waterline, Pershing County, Nevada	Skinner 1996	0	6 (5 not eligible to the Register, 1 eligible)

Table 3-31

Florida Canyon Mine Project Area Cultural Resource Sites Located Within the Area of Potential Effect (APE)

Site Number	Site Description	National Register of Historic Places Status[1]	State Historic Preservation Officer Concurrence	Eligibility[2] Criteria	Land Ownership	BLM Report Number/ Reference
CrNV-22-2275	Lithic scatter, projectile point	NEL	James June 27, 1996	--	Private	CR2-381(P) (Smith 1980b) CR2-538(P) Smith 1981)
CrNV-22-3344	Small lithic scatter	RI/UE	No	--	Public	CR2-1035(P) (Botti 1985)
CrNV-22-3345	Lithic scatter	NEL	Baldrica November 12, 1991	--	Private	CR2-1035(P) (Botti 1985) CR2-2442 (Kautz 1991)
CrNV-22-3348	Historic mining site	NEV/UE (identified as destroyed during survey by Miller et al. 1996)	No	--	Private	CR2-1035 (P) (Botti 1985) CR2-2689(P) (Miller et al. 1996)
CrNV-02-3350	Small lithic scatter	NEL	James June 27, 1996	--	--	CR2-1035(P) (Botti 1985)
CrNV-22-6301, -6306, -6313 to -6315, -6319, -6326, -6328, -6329, -2275	Lithic scatters, prospect pits	NEL	James June 27, 1996	--	Public/Private	CR2-2689(P) Miller et al. 1996)
Total number of cultural sites within APE = 15 Total number of NRHP-eligible or unevaluated sites within APE = 1						

Table 3-31 (Continued)

FOOTNOTES:

[1]NR/UE - No recommendation; unevaluated.
RI/UE - Unevaluated; recommended ineligible.
RE/UE - Unevaluated; recommended eligible.
NEV/UE - Additional information required per agency recommendation; unevaluated.
E - Eligible to the NRHP with SHPO concurrence.
NEL - Not eligible to the NRHP with SHPO concurrence.
APE - Area of potential effect.

[2]National Register of Historic Places Eligibility Criteria:

a: Sites that are associated with events that have made a significant contribution to the broad patterns of history.

b: Sites that are associated with the lives of persons significant in our past.

c: Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

d: Sites that have yielded, or may be likely to yield, important information on prehistory or history.

Table 3-32

Florida Canyon Mine Project Area Cultural Resource Sites Located in the Cumulative Effects Area or Adjacent to the APE[1]

Site Number	Site Description	National Register of Historic Places Status[2]	State Historic Preservation Officer Concurrence	Eligibility[3] Criteria	Land Ownership	BLM Report Number/ Reference
CrNV-22-232	Trash midden associated with Humboldt House	NEL	James June 27, 1996	--	Private	CR2-51(P) (Roney 1976) CR2-103(P) (York 1977) CR2-2689(P) (Miller et al. 1996) CR2-2239(P) (Elston & Stornetta 1988)
CrNV-02-388	Rock fortification; rock alignments.	NEV/UE	James June 27, 1996	--	Public	CR2-103(P) (York 1977) CR2-2689(P) (Miller et al. 1996)
CrNV-02-394	Humboldt City	RE/UE	No	a, d	Public/ Private	CR2-103(P) (York 1977)
CrNV-02-408	Humboldt House and trash dump	RE/UE	No	a, d	Private	CR2-103(P) (York 1977) CR2-2239(P) (Elston & Stornetta 1988)
CrNV-02-2645	Chipping station	RI/UE	No	--	Private	CR2-538(P) (Smith 1981)
CrNV-22-3069	Lithic scatter/temporary camp	E	James June 27, 1996	d	Public	CR2-865(P) (Pedrick 1983) CR2-2689(P) (Miller et al. 1996)
CrNV-22-3342	Small lithic scatter	RI/UE	No	--	Private	CR2-1035(P) (Botti 1985)
CrNV-22-3353	Lithic scatter	RI/UE	No	d	Private	CR2-1035(P) (Botti 1985) CR2-2689(P) (Miller et al. 1996)
CrNV-22-5618, -5621, -5622	Lithic scatters	NEL	Baldrica May 12, 1993	--	Public/ Private	CR2-2524(P) (Mires & Kantz 1993)

Table 3-32 (Continued)

Site Number	Site Description	National Register of Historic Places Status[2]	State Historic Preservation Officer Concurrence	Eligibility[3] Criteria	Land Ownership	BLM Report Number/ Reference
CrNV-22-6299, -6300, -6302, -6304, -6305, -6316 to -6318, -6320, -6321, -6325, -6344	Lithic scatters, adit (-6344)	NEL	James June 27, 1996	--	Public/ Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6307	Rock Shelter	E	James June 27, 1996	d	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6312	Rock Shelter	E	James June 27, 1996	d	Public	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6327	Lithic scatter	E	James June 27, 1996	d	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6333	Stone house	NEV/UE	James June 27, 1996	--	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6337	Piedmont Mine	E	James June 27, 1996	a,c,d	Public/ Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6339	Florida Flats Company townsite	E	James June 27, 1996	d	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6340	Adits	E	James 1996	d	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6341	Adits	E	James 1996	d	Private	CR2-2689(P) (Miller et al. 1996)
CrNV-22-6414 to -6418	Historic debris scatters, prehistoric lithic scatters	NEL	Baldrica December 20, 1996	--	Public/ Private	CR2-2665(P) (Skinner 1996)

Table 3-32 (Continued)

Site Number	Site Description	National Register of Historic Places Status[2]	State Historic Preservation Officer Concurrence	Eligibility[3] Criteria	Land Ownership	BLM Report Number/ Reference
CrNV-22-6413	Historic structure with foundation and debris scatters	E	Baldrica December 20, 1996	a,d	Public/ Private	CR2-2665(P) (Skinner 1996)
Total number of sites within cumulative assessment area or adjacent to APE = 37 Total number of NRHP-eligible or unevaluated sites within cumulative assessment area or adjacent to APE= 16						

[1]Sites adjacent to APE lie within 500 feet of the APE and/or could have the integrity of the setting, feeling, or association impacted by the proposed operations.

[2]NR/UE - No recommendation; unevaluated
RI/UE - Unevaluated; recommended ineligible
RE/UE - Unevaluated; recommended eligible
NEV/UE - Additional information required per agency recommendation; unevaluated
E - Eligible to the NRHP with SHPO concurrence.
NEL - Not eligible to the NRHP with SHPO concurrence.
APE - Area of potential effect.

[3]National Register of Historic Places Eligibility Criteria:

a: Sites that are associated with events that have made a significant contribution to the broad patterns of history.

b: Sites that are associated with the lives of persons significant in our past.

c: Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

d: Sites that have yielded, or may be likely to yield, important information on prehistory or history.

-3350 were found ineligible to the Register with SHPO concurrence (Baldrica 1991, James 1996). Site CrNV-22-3348 was reevaluated by Miller (et al. 1996). Miller's survey indicated that Site CrNV-22-3348 had been destroyed during operations at the existing mine. Site CrNV-22-3344, which consists of a small lithic scatter, was determined ineligible to the Register by the BLM, however, final determination from the SHPO is pending. Two other sites lying within the cumulative assessment area were identified by Botti (CrNV-22-3342 and -3353). Both sites have been determined ineligible to the Register by the BLM; final determination on these two sites is pending from the SHPO.

An archaeological reconnaissance conducted on behalf of Nevada Bell's rural improvement program (BLM Report # CR2-2239[P]) identified two sites, CrNV-02-232 and -408, located within 500 feet of the APE and the cumulative assessment area (Elston and Stornetta 1988). No recommendations on NRHP-eligibility for these sites were made by Elston and Stornetta. Site CrNV-02-408, the Humboldt House site, was previously identified by York (1977) who recommended the site as eligible to the NRHP. Concurrence from the SHPO on this site is still pending. Site CrNV-02-232, a pumphouse and corral associated with the Humboldt House site, was originally identified by Roney (1976) and reevaluated by York (1977) and Miller (et al. 1996). Site CrNV-02-232 was determined ineligible to the NRHP with SHPO concurrence (James 1996).

An inventory of a proposed 490-acre mine expansion between Florida Canyon and Humboldt Canyon conducted by Mires and Kautz (1993) identified three lithic scatters lying within the cumulative assessment area; CrNV-22-5618, -5621, and -5622. All three sites were determined ineligible to the NRHP with concurrence from the SHPO (Baldrica 1993). During this survey, areas with slopes in excess of 25° were optically scanned from opposing slopes using binoculars due to safety purposes. Concurrence on this survey method was received from the BLM and the SHPO (McGuckian 1993a).

A 3,600-acre inventory (CR2-2698[P]), conducted as part of the proposed project, identified 11 sites located within the proposed APE and 24 sites located within the cumulative assessment area or within 500 feet of the APE (see Tables 3-31 and 3-32) (Miller et al. 1996). All of the sites located within the APE, however, were found either to have been destroyed by previous mining operations (CrNV-22-3348, previously identified by Botti 1985) or were determined to not be eligible to the NRHP with SHPO concurrence (James 1996). Of the 24 sites located by Miller et al. within the cumulative assessment area or within 500 of the APE, 13 are not eligible to the Register with SHPO concurrence, 3 are unevaluated, and 8 are determined eligible to the Register with concurrence from the SHPO (see Table 3-32) (James 1996).

In 1996, Skinner (1996) conducted an inventory of approximately 21 acres along the ROW for the then-proposed water supply pipeline between lower Pitt-Taylor Reservoir and the existing mine site. The inventory resulted in the documentation of six previously unidentified sites located within the cumulative assessment area (CrNV-22-6413 to -6418). Two other sites were identified outside of the cumulative assessment area (CrNV-22-6419, -6420). Sites CrNV-22-6414 to -6418, which included historic debris scatters and prehistoric lithic scatters, were determined ineligible to the Register in consultation with the SHPO. Site CrNV22-6413, a historic structure and foundation with debris scatters, was determined eligible to the Register with concurrence from the SHPO (Skinner 1996; Baldrica 1996). All of the sites lie within the cumulative assessment area and are expected to be disturbed under the existing operations. No adverse effects as a result of existing operations are expected to occur to Site CrNV-22-6413 however, since the portion of the property that the water pipeline route would pass through has been previously disturbed and does not contribute to the site's eligibility. In addition, any effect to the setting and/or feeling of CrNV-22-6413 would be temporary in nature and will not be visible after the pipeline is buried and the route restored to the original grade (Baldrica 1996).

In summary, no eligible sites and only one unevaluated site (CrNV-22-3344) have been evaluated as lying within the APE. This site has been determined ineligible to the NRHP by the BLM and final determination is pending from the SHPO. Three unevaluated sites (CrNV-02-2645, CrNV-22-3342, -3353) lie within the cumulative assessment area. All three sites have been determined not eligible to the Register by the BLM pending concurrence from the SHPO. Thirteen eligible or unevaluated sites (CrNV-02-388, -394, -408, -22-3069, -6307, -6312, -6327, -6333, -6337, -6339, -6340, -6341, -6413) have been identified as lying within 500 feet of the APE but outside of the cumulative assessment area (see Table 3-32).

3.14.1.3 Ethnography

Setting

Aboriginal groups occupying the study area prior to contact with Euroamericans included the Paviotso, who were part of the Northern Pauite linguistic group, a Numic language subgroup. The subgroup that occupied the area were called the Küpadökadö or "ground squirrel-eaters" (Skinner 1996). The territory of two other Pauite subgroups, the Makuhadökadö, and the Sawawaktodo overlapped with the Küpadökadö in the vicinity of the project area. These people maintained a semi-nomadic lifestyle that corresponded to the availability of floral and faunal subsistence resources on a seasonal basis. Hunting of large and small game, including deer, rabbit, waterfowl and rodents, fishing using nets, harpoons, and weirs, and gathering of grass seed, roots, berries, and pine nuts provided subsistence (Mires and Kautz 1993). Resources found at the lakes and streams, including the Humboldt River area, were heavily utilized by the Northern Paiute.

The Küpadökadö subgroup was centered around the Lovelock area and the Humboldt Sink, an area of over 3,600 square miles. Their estimated population in 1866 was 800 or approximately 1 person for every 4.5 square miles. The Sawakvaktodo were located principally around the site of present day Winnemucca (Botti 1985). The Küpadökadö's territory lay in proximity to the California Emigrant Trail and they were one of the first Paiute bands to feel Euroamerican influence. An early battle near the Humboldt Sink area arose from the shooting of a Küpadökadö band member by the Walker party in 1834; after the encounter, the Küpadökadö reportedly left the Humboldt Sink area and few were reported in the vicinity for a number of years (Botti 1985). A quarter/quarter section of land within the Humboldt City area was allotted to Lizzie Winap, a Shoshone Indian, in 1920 and remains as Indian trust land (Wilson 1920).

House types and clothing varied considerable depending upon the availability of resources. Dwellings were generally simple wickiup-style structures made of bent wooden poles covered with grass tule or brush mats over a circular depression ranging in size from 8 to 15 feet in diameter or roofless semicircular brush shelters (Tuohy 1963; Mires and Kautz 1993). Grinding stones, such as manos and metates and mortars and pestles, were used to prepare the vegetable foods that formed a large part of their diet. Baskets were used for containers, storage vessels, seedbeaters, winnowing trays and fishing devices. Pottery was apparently not produced by the Northern Pauite (Tuohy 1963). Rabbit skin blankets and blankets woven of sagebrush bark were worn in winter. Small mammals were hunted with sinew-backed bows and arrows with fire-hardened wood tips. Stone-tipped composite arrows were used to hunt large game. Communal antelope and rabbit hunts were common. The taking of waterfowl and fish also was often a communal enterprise (Tuohy 1963). Burial was accomplished by removing the deceased from the home, wrapping the body in a flexed position, and leaving it in an isolated location. Burial goods may have been burned or simply left with the dead. The house of the dead was either torn down or burned (Mires and Kautz 1993).

Native American Coordination

Recent legislation and regulations provide for Federal agencies to consult with Native Americans before certain types of land or resource management decisions are implemented. These acts and regulations, which provide a measure of protection to traditional Native American religious and other cultural

beliefs and practices, include: 1) the American Indian Religious Freedom Act; 2) the Religious Freedom Restoration Act; 3) the Archaeological Resources Protection Act; 4) the National Historic Preservation Act, as amended to provide a role for Indian Tribal groups in Section 106 consultation provisions; 5) the Native American Graves Protection and Repatriation Act; 6) the Nevada Indian Burial Protection legislation, 7) NEPA, and 8) FLPMA.

Notification letters and requests for comments were sent in November 1996 to the Tribal Chairs of the Fort McDermitt Tribal Council, the Winnemucca Tribal Council, and the Lovelock Paiute Tribe. These groups were identified as having potential ties to the project area. Follow-up phone calls were made on February 13, 1997, to the Lovelock Colony Tribal Chair, where recommendations were made by Mrs. Darlene Williams, a Tribal elder that the BLM attend a meeting of the Tribal council members, Tribal elders and other Tribal members. BLM attended the meeting on February 7, 1997, in the Lovelock Tribal building and described the proposed project and cultural sites located in the area. Indian trust land located in Humboldt Canyon and concerns regarding potential effects to historic Humboldt City in Humboldt Canyon also were discussed. The Tribe was assured that the Proposed Action would not intrude on the townsite or affect its viewshed at the present time. The Tribe expressed no concerns about the proposed project (McGuckian 1997).

BLM met during a regularly scheduled Tribal council meeting with the Tribal council members and other Tribal members of the Winnemucca Colony on February 8, 1997, at the Winnemucca Tribal building. The Proposed Action and concerns previously identified at the Lovelock Colony meeting were discussed. The council members did not identify any traditional cultural properties in the proposed project area; however, they indicated that the mine lies within the area that the Winnemucca Colony claims is covered by the Ruby Valley Treaty signed by representatives of the Western Shoshone in 1863 at Fort Ruby in the Ruby Valley (located east of the area). Although mining is allowed on these lands under the treaty, the Colony believes that effects to land, water, plants and animals as a result of the Proposed Action are not (McGuckian 1997).

The Fort McDermitt tribal representative, Ms. Helen Snapp, was contacted by the BLM in a follow-up phone call. No concerns were expressed.

3.14.1.4 Paleontology

Paleontological resources or fossils are the physical remains, impressions, or traces of plants or animals from past geologic ages. Paleontological resources are important mainly for their potential to provide scientific dating information, information on the evolutionary history of plants and animals, and information on paleoenvironments and paleoclimates. Vertebrate fossils are generally considered to be the most significant; however, rare occurrences of invertebrates, plants, and other diagnostic fossils also can provide valuable information.

The project area lies within areas of Triassic and Quaternary-age geologic formations. BLM maps in the Winnemucca Field Office locating areas of potential and significant paleontological importance within the project area indicated that the northern portion of the Humboldt Range in the vicinity of the project area had significant potential for fossiliferous deposits.

The Humboldt Range, which rises on the eastern edge of the project area, is known as a classic locality for Middle Triassic paleontology, mainly because fossils from this age are locally abundant at certain levels throughout the Middle Triassic portions of the range (BLM 1996a). The major fossiliferous strata in the range include the Fossil Hill Member and Upper Member of the Prida Formation, and the Dun Glen Formation. The Natchez Pass Formation also contains locally abundant fossils, but to a lesser extent than those formations previously mentioned. The distribution of the fossils within these formations are uneven, partly because of original deposition patterns and hydrothermal metamorphic occurrences within the range. In spite of this, the record of Middle Triassic fossils in the Humboldt Range is one of

the most complete of any known in the world (BLM 1996a; Silberling and Wallace 1969).

The Prida Formation contains numerous invertebrate fossils, consisting mainly of ammonites, pelecypods, conodonts, and brachiopods, all of which are common and used extensively in biostratigraphic analysis or correlating the ages of rock units using fossils. Conodonts are found in the Lower and Middle members of Prida Formation and are the small, tooth-like fossil remains of microscopic organisms. They are extensively used as a biostratigraphic tool, however, they are abundant and are not considered to be a significant paleontological resource. The Middle Member of the Prida Formation also has perhaps the most complete succession of ammonites fossils known in the world. Ammonite fossils have been found approximately 1.5 miles south of the project area. Pelecypod and ammonite fossils also have been found on the north side of Humboldt Canyon in the Natchez Pass Formation. A large deposit of marine invertebrate fauna, including pelecypods and cephalopods, has been located in the Natchez Pass Formation near Mill City. Few fossils, other than traces of plant remains, are found in the Grass Valley Formation (Silberling and Wallace 1969; Lawler 1978).

Skeletal remains of ichthyosaurs, large extinct, prehistoric marine reptiles that are considered significant paleontologic resources in the area, are common in the Middle Member of the Prida Formation. Ichthyosaurs are one of the earliest, but most poorly known, North American members of the marine reptilian group. Ichthyosaur remains have been identified approximately 3 miles southeast of the project area. The teeth and spines of several types of prehistoric hybodontid sharks also have been found in the Middle member of the Prida Formation. These fossils are important because they represent one of the few known occurrences of Triassic-age hybodont sharks in North America (Lawler 1978; Silberling and Wallace 1969).

A prehistoric lake, known as Lake Lahontan, formed Quaternary-age Pleistocene lake terraces on the western portion of the project area approximately 20,000 years ago. Approximately 22,000 to 29,000 years ago, quicksand springs located adjacent to the lake trapped horses, camels, mammoths and many smaller mammals creating an extensive paleontological vertebrate remains site that was excavated between 1975 and 1983 by Rusco and Davies (1987). The site is located at Rye Patch Reservoir approximately 7 miles north/northwest of the project area. The fossils were recovered from loosely consolidated Quaternary-age sand and silts, which may have formed quicksand traps at the time of deposition. The site has been described as the richest deposit of Pleistocene-age fossil mammal material in Nevada (Lawler 1978).

The project area is split almost equally in half between Triassic-age formations and Quaternary-age formations. The most easterly portions of the proposed exploration area lie within areas of the Lower and Middle Members of the Triassic-age Prida Formation. Other portions of the proposed exploration area, sections of the proposed waste rock dump expansion areas and the pit expansion lie within the Triassic-age Grass Valley Formation and the Natchez Pass Formation. The proposed South Heap Leach Pad, sediment ponds, and the western portion of the North Waste Rock Dump expansion area lie within Quaternary-age alluvium and Lahontan lacustrine deposits. No significant fossils have been located to date within the project area, although some common marine mollusk fossils have been identified in the mine vicinity (BLM 1995).

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action

<u>Cultural Resources</u>

Discussions of project impacts are limited to sites within the APE deemed to be significant or eligible for inclusion on the NRHP or sites that have Federal and/or state protection under other statutes. The significance of a cultural heritage resource is an assessment of its importance to the citizens of the United States and indicates whether a site has attributes that qualify it for inclusion on the NRHP. In order to be considered

eligible for the NRHP, a cultural resource must be a district, site, building, structure, or object that retains its integrity of location, design, setting, materials, workmanship, feeling, and association, and satisfies at least one of the four significance criteria defined in 36 CFR part 60.4. (Appendix F - Cultural Resources Significance Criteria Definitions).

Direct impacts to one cultural resource sites (CrNV-02-3344) that is unevaluated as to its eligibility to the NRHP could occur as a result of proposed operations. Depending upon the site's current condition, ground-disturbing activities could result in direct impacts in the form of vertical and horizontal displacement of soils containing cultural materials and in the loss of integrity of the cultural deposits, loss of information, and alteration of site setting. Additionally, construction could result in direct impacts by altering the site's settings and isolating the resource from access and further study.

Site CrNV-22-3344, however, consists of only two obsidian tertiary flakes located on a gravel bench next to the juncture of two washes. The site, first identified in BLM Report CR2-1035(P), probably represents transient utilization of the area and the BLM has determined that this site is not eligible to the Register under Criteria "a","b","c", or " d". The site is limited in content and lacks features and datable material. SHPO concurrence on the BLM's determination for this site is pending.

In addition to the unevaluated site identified within the APE there also are 13 NRHP-eligible or unevaluated sites have been identified that lie within approximately 500 feet of the APE and/or could have the integrity of their setting, feeling, or association impacted by the Proposed Action. Three of these sites, CrNV-02-2645, CrNV-22-3342, and CrNV-22-3353, have been determined ineligible to the NRHP by the BLM with SHPO concurrence pending on the determination. Eight sites are eligible to the Register with SHPO concurrence (CrNV-22-6327, -3069, -6312, -6339, -6341, -6340, -6337, -6307) and two sites remain unevaluated pending additional data gathering (CrNV-22-388,-22-6333).

Indirect impacts to cultural resources located within 500 feet of the APE may occur during ground-disturbing activities associated with construction and operation of the mine pit, the North Waste Rock Dump, access and exploration roads, and drill pads. No permanent increases in the number of people in the area are expected to occur as a result of the Proposed Action; however, improvements in access in the area, particularly in the vicinity of the proposed exploration roads, could impact sites located outside of the direct impact area by making the sites more susceptible to vandalism and casual collecting. Changes in topography due to road and pit expansion and construction and waste rock disposal also could result in indirect impacts to cultural resources due to alteration of the amount or patterns of erosion.

Indirect impacts to the sites would be reduced by implementing the proposed environmental protection measures developed as part of the EIS (see Chapter 2.0, Section 2.2.14.7). These measures would include employee education programs, boundary marking, and erosion control measures and reclamation on access and exploration roads. The employee education program would inform employees of the value of cultural resources and the penalties associated with violation of antiquities laws. Boundary marking would consist of distinctly marking the mine permit boundary in the vicinity of the eligible sites and restricting equipment use beyond this boundary. Implementation of the erosion control measures in access and exploration roads and reclamation of these roads following project completion would reduce secondary effects to eligible sites from erosion. These measures would reduce, but not completely eliminate the potential for indirect effects from the proposed action.

Three sites, CrNV-02-408 (Humboldt House), CrNV-02-394 (Humboldt City), and CrNV-22-6337 (Piedmont Mine), that are either eligible under Criteria "a" or are recommended eligible under Criteria "a" are located outside of the APE, but within view of the proposed action. The Humboldt House complex lies within a quarter mile north of the APE and straddles I-80. The Piedmont Mine lies within 200 feet of the

proposed exploration road area. Given the presence of the freeway and the existing development at the mine, the proposed action should not significantly increase impacts to the integrity of the setting, feeling or association of these two sites. In addition, following mine closure, the mine property will be reclaimed, thereby reducing visual impacts in the long-term.

Humboldt City is located within a quarter mile northeast of the proposed exploration area. No impacts to the integrity of the setting, feeling, and association of this site is anticipated since all proposed mine activity would occur to the west of the ridge separating Humboldt City from the mine operations and noise levels should be similar to those identified from existing operations.

If previously undocumented sites or subsurface components of documented sites are discovered within the project area during construction and expansion, construction would be halted in the area until the site could be analyzed by a professional archaeologist; as outlined in the environmental protection measures identified in Section 2.2.14.7. If the previously unidentified resources are determined eligible for the NRHP or protected under other state and Federal statues, impacts would be mitigated through an appropriate data recovery program agreed upon by the BLM, FCMI, the SHPO and the Advisory Council on Historic Preservation.

Prior to initiation of any disturbance on-site, a Section 106 consultation between the BLM and the SHPO must be completed, as required under 36 CFR 800. Section 106 consultation with the Nevada SHPO regarding the project's effect on cultural resources is currently being conducted. The Section 106 process is expected to be completed prior to the approval of the project (36 CFR 800.3c).

Native American Concerns

Few concerns have been expressed by Native American Tribal groups contacted regarding the Proposed Action. Although consultation activities conducted to date have not identified traditional use properties within or immediately adjacent to the APE, the proposed project effects on land, water, plants and animals in the area were of concern, primarily as they relate to the tenants of the Ruby Valley Treaty, which representatives of the Winnemucca Colony believe applies to the area around the Proposed Action. Impacts to these resources are discussed in Sections 3.3 (Water Resources and Geochemistry), 3.6 (Vegetation Resources), 3.7 (Wildlife and Fisheries Resources), 3.8 (Special Status Species), and 3.10 (Land Use and Access).

Paleontology

Invertebrate and vertebrate fossils occur in formations that are found in the project area. Geologic maps of the project area indicate that occurrences of the Lower and Middle Members of the Prida Formation, which have been identified as containing significant vertebrate fossils are located under the most easterly portions of the proposed exploration area. Exploration road construction and drilling in this area could potentially impact previously unidentified fossil deposits found in this formation. The Natchez Pass Formation, which contains relatively common invertebrate fossils, also lies under portions of the exploration area. The majority of the mine area, particularly the main operations area, the leach pad and waste rock dumps, are located on the Grass Valley Formation or Quaternary-age lacustrine deposits. Both of these formations have a low potential for significant fossils.

Continued placement of waste rock and expansion of the pit would not disturb known areas of significant fossil-bearing formations; however, because fossils are usually buried, their locations cannot be confirmed until excavation or drilling occurs.

Potential direct impacts to the resources from the Proposed Action would be limited to areas of disturbance. Potential indirect impacts could result from improved access to fossil-bearing formations via improved transportation routes, including construction of exploration roads. Implementation of the environmental protection measures identified in Section 2.2.14.7 would reduce impacts to paleontological resources. Following mine closure, indirect impacts are

expected to be slightly reduced with the decrease in human activity in the area.

3.14.2.2 North Extension of the Heap Leach Pad Alternative

Cultural Resources

Impacts to cultural resources under this alternative would generally be similar to those identified for the Proposed Action. Construction of replacement portions of the communication road associated with this alternative could potentially lead to indirect impacts to site CrNV-22-388.

Native American Concerns

Impacts associated with Native American concerns would be similar to those identified under the Proposed Action.

Paleontology

Impacts to paleontological resources would be similar to those discussed under the Proposed Action.

3.14.2.3 No Action Alternative

Cultural Resources

Under the No Action Alternative, impacts to cultural heritage resources from mine expansion would not occur. Continued erosional effects and illegal collecting would continue to occur at a rate similar to what is currently taking place in the area.

Native American Concerns

Under the No Action Alternative, no impacts to Native American heritage resources would happen beyond those currently occurring as identified in Section 3.14.1, Affected Environment.

Paleontology

Under the No Action Alternative, no impacts to paleontological resources would happen beyond those currently occurring as identified in Section 3.14.1, Affected Environment.

3.14.3 Cumulative Impacts

3.14.3.1 Cultural Resources

As depicted in Maps 3-25 and 3-26, the cumulative assessment area for cultural resources includes the area within the proposed mine permit boundary and the water supply pipeline ROW between lower Pitt-Taylor Reservoir and the existing mine site. Other future actions proposed in the region, including the expansion of several mines, would be located a substantial distance outside of the cumulative assessment area boundary identified for cultural resources. Cultural resource inventories have been completed over the entire cumulative assessment area, and cultural resources have been documented and sites evaluated for significance in terms of the NRHP. Eligible sites have been generally avoided by previous actions. The 16 inventories conducted in the cumulative assessment area have identified a total of 52 known cultural sites within the cumulative assessment area (Tables 3-31 and 3-32). These included 9 sites that are eligible to the Register with SHPO concurrence, 34 sites not eligible to the Register with SHPO concurrence, one site that has been destroyed, and 8 unevaluated sites (see Tables 3-31 and 3-32).

Although no reasonably foreseeable future actions have been identified within the cumulative assessment area, historic and existing mining operations and related projects in the area have impacted at least seven of the known cultural sites within the cumulative assessment area (CrNV-22-3348, -22-6413 to -22-6418). Of these seven sites, only CrNV-02-3348 and CrNV-22-6413 were either unevaluated or eligible to the NRHP, respectively. Sites CrNV-22-6414 to -6418 have been found ineligible to the NRHP with SHPO concurrence (Baldrica 1996). CrNV-02-3348 was identified as being destroyed during a survey by

Miller (et al. 1996). The site was originally identified by Botti (1985), who indicated that the site was probably eligible to the Register, but that further work was required to clearly evaluate its potential. Site CrNV-22-6413 was evaluated as part of the waterline project and determined eligible to the Register with SHPO concurrence (Baldrica 1996). Although the waterline will pass through a portion of CrNV-22-6413, both the BLM and the SHPO concurred that no adverse effect would occur to the site since the waterline route would be located in a portion of the property that has been previously disturbed and that does not contribute to the site's eligibility. With burial of the pipeline, any effect to the setting and/or feeling of the site would be temporary in nature and would not be visible following completion of the waterline (Baldrica 1996).

The Proposed Action is expected to directly impact only one site, CrNV-22-3344, which has been determined ineligible to the NRHP by the BLM, pending SHPO concurrence. See Section 3.14.2, Environmental Consequences, for a detailed discussion on impacts to cultural resources under the Proposed Action.

Current disturbances, including ongoing Florida Canyon Mine operations, have been subject to cultural heritage resource protection regulations. The majority of the areas have been surveyed to Class III standards for cultural heritage resources, and, in the case of current work, sensitive sites were avoided. See Section 3.14.1.2, Cultural Resources Identified in the Project Area, for a discussion of past surveys conducted in the ongoing Florida Canyon Mine operations area. All actions associated with the proposed project would be in accordance with guidelines established between FCMI, BLM, the SHPO, and the ACHP.

Future mining or other ground-disturbing activities within the cumulative assessment area could impact NRHP-eligible or unevaluated sites. As directed by law, cultural heritage resource inventories and consultations would be conducted for any projects involving public lands, and impacts would be avoided or mitigated, as appropriate. Additional cultural inventories and consultations required for future expansions would add to the information base for cultural heritage resources within the cumulative assessment area. Compliance with Sections 106 and 110 of the NHPA would result in evaluation and mitigation or treatment plans for any significant properties identified during the inventories for future actions and also would increase the overall knowledge of cultural heritage resources in the cumulative assessment area.

Direct impacts to cultural heritage resources would be reduced under the provisions of the NHPA, which requires that cultural heritage resources be considered in any Federal undertaking. Even with mitigation, physical destruction of sites could still occur in the future, and there could be a permanent loss of some cultural heritage sites. Permanent loss of sites also has occurred within the areas disturbed by past and present actions. Indirect impacts, such as vandalism and illegal collecting, have and could occur to cultural heritage resources through increased access, development, and increased human presence, as a result of past, present, and future activities. Indirect effects to cultural resources by existing and future actions may be reduced, but not eliminated by implementing the environmental protection measures identified in Section 2.2.14.7.

3.14.3.2 Native American Concerns

Disturbance to traditional lifeway values of Native Americans and other ethnic groups from developments associated with past projects, present projects, and future actions could occur if they have not been previously identified. No Native American religious or traditional use areas have been currently identified within the cumulative assessment area; however, consultation with the appropriate Tribal councils would be required under AIRFA, NHPA, NEPA, and FLPMA prior to any future action taking place within the cumulative assessment area.

3.14.3.3 Paleontology

Past and present activities in the cumulative assessment area for paleontological resources, as shown on Map 3-27, are not known to have directly impacted paleontological resources in the area. However, past mining operations conducted by American Copper and Nickel in T31N, 34E, Sections 19 and 30, are located in the Prida Formation, a geological unit known for significant reptilian vertebrate fossils. Excavation of a significant paleontological site located on land exposed during a drawdown of Rye Patch Reservoir (Section 3.14.1, Affected Environment) lies adjacent to the cumulative assessment area and has provided extensive data on the past environment of the region.

The paleontological resources in the project area may have been indirectly impacted by the development of access roads and the influx of people associated with the Florida Canyon Mine and the geothermal operation south of the mine.

No future plans to develop projects within the cumulative assessment area were identified beyond those already outlined for the Proposed Action (see paleontological impact discussion in Section 3.14.3, Cumulative Impacts). The discovery of significant and previously unknown paleontological resources during the Proposed Action could provide additional paleontological information if data recovery proceeds on directly impacted paleontological sites that might be located during mine expansion.

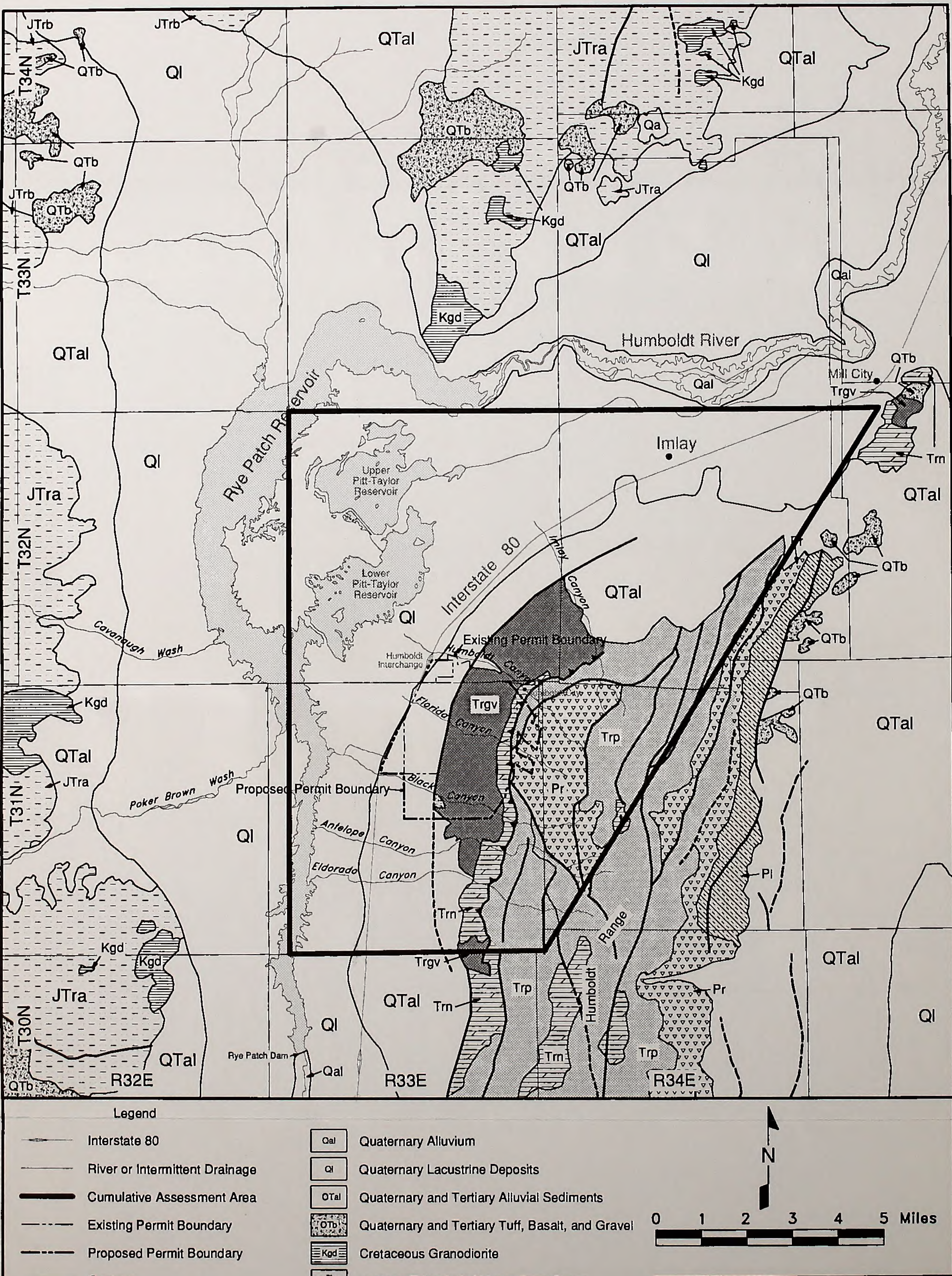
3.14.4 Potential Mitigation and Monitoring

Please refer to environmental protection measures identified in Section 2.2.14.7.

3.14.5 Residual Adverse Impacts

Direct and indirect impacts to NRHP eligible sites or other Federally or state-protected sites on Federal, state, or mine property would be prevented or reduced as provided for under the environmental protection measures identified in Section 2.2.14.7; however, residual impacts to cultural heritage resources could result in the permanent loss of site context and traditional use, and in the case of sites indirectly impacted, could potentially result in the loss of information and artifacts.

Although environmental protection measures identified in Section 2.2.14.7 would reduce affects, paleontological resources also could experience residual direct and indirect impacts that could result in the loss of information or context. No Tribal concerns or traditional use sites have been identified to date; therefore, no residual adverse effects are anticipated for Native American issues.



Florida Canyon Mine

Map 3-27

Paleontological Resources Cumulative Assessment Area

3.15 Hazardous Materials

3.15.1 Affected Environment

The potentially affected environment resulting from the presence of hazardous materials and waste includes air, water, soil, and biological resources. The environment could be affected in the event of an accidental release of hazardous materials or wastes during transportation to and from the project area or during storage and use at the project site.

FCMI currently transports process- and mining-related chemicals to the mine by truck from numerous locations within Nevada and surrounding states. All of the hazardous materials are transported along I-80; however, many other roads also are used for shipping. I-80 is located adjacent to the Humboldt River both north and west of the site. Some of the transport routes also pass near other surface water bodies and cross a number of streams.

The hazardous materials that are currently used at the site are listed in Table 2-2. The site is classified as a Small Quantity Generator of hazardous waste under the Resource Conservation and Recovery Act guidelines. Approximately 9,000 pounds of hazardous wastes are generated at the facility per year. Hazardous waste is hauled to Cominco Metals in Trail, British Columbia, by Erickson, Inc., an approved hazardous waste transporter.

<u>Hazardous Materials</u>

The existing operations include transporting, handling, storing, using, and/or disposing of the following materials classified as hazardous by 49 CFR 172.101:

1. Diesel fuel, gasoline, propane, petroleum oils, greases, ethylene glycol, acetylene, oxygen, and solvents used to operate and maintain equipment;

2. Sodium cyanide, sodium hydroxide, sodium nitrate, zinc, portland cement, calcium oxide (lime), hydrochloric acid, flocculent, and antiscalant used in the gold extraction processes;

3. Ammonium nitrate and explosives used for blasting in the open pit;

4. Various by-products and chemicals classified as hazardous waste from the assay laboratory;

5. Calcium hypochlorite is stored on-site for use as a neutralizing agent in case of cyanide releases; and

6. Mercury is a by-product of the mining process.

Of the chemicals cited above, sodium cyanide, sodium hydroxide, hydrochloric acid, calcium hypochlorite, zinc, mercury, and ethylene glycol are hazardous substances that also are listed in the 40 CFR 302.4 of the CERCLA and the appendices of the Superfund Amendments and Reauthorization Act. There are established reportable quantities for these chemicals, which apply to the reporting requirements associated with a release of each chemical. Petroleum products also have an established reportable quantity, but are excluded as hazardous substances under CERCLA Section 101(14). A summary of the CERCLA reportable quantities for those chemicals discussed above is presented in Table 3-33. The reportable quantity for petroleum products is 25 gallons released to the ground surface.

<u>Transportation</u>

Trucks are used to transport a variety of non-hazardous materials as well as hazardous materials and wastes to and from the project site. Based on their hazardous characteristics, volume, and number of deliveries, the materials of greatest concern are sodium cyanide, sodium hydroxide, and diesel fuel.

Table 3-33

CERCLA Reportable Quantities

Material	CERCLA Reportable Quantities (pounds)
Mercury	1
Ethylene Glycol	1
Sodium Cyanide	10
Calcium Hypochlorite	10
Sodium Hydroxide	1,000
Zinc	1,000
Hydrochloric Acid	5,000
Solvents	100-5000

Sodium cyanide is considered to be the most hazardous material to be delivered to the site, due to the toxic nature of the chemical. Sodium cyanide solution is transported to the site by Du Pont Specialty Chemicals in specially designed tanker trucks with a capacity of 6,300 gallons. Another potentially hazardous chemical delivery is that of corrosive sodium hydroxide. Diesel fuel also is considered to be one of the most hazardous materials transported to the site. Although diesel is not among the most toxic of materials used at the site, it is delivered in the greatest quantity and frequency.

The sodium cyanide used at the site is supplied from Carlin, Nevada, located approximately 143 road miles east of the site. The sodium hydroxide is supplied from Nampa, Idaho, located approximately 275 road miles north of the site. Diesel fuel is supplied from Reno, Nevada, located approximately 127 road miles southwest of the site. The routes used to transport the materials to the site all include I-80. The sodium cyanide and diesel fuel are transported directly to the mine site on I-80 from the east and west, respectively. The sodium hydroxide is transported from Nampa on U.S. Highway 95 to Winnemucca, then on I-80 to the mine site.

Information provided by FCMI indicates the delivery frequency for the primary chemicals of concern. Sodium cyanide is presently delivered to the site at a rate of twenty 18,000-pound loads per month and sodium hydroxide is delivered to the site at a rate of one 30,000-pound load per month. A shipment of 11,500 gallons of diesel fuel arrives at the site approximately 20 times per month.

The risk of an accident involving deliveries of these three substances was evaluated using Hazardous Materials Transportation Risk Analysis (Rhyne et al. 1994). According to these national statistics, the average rate of truck accidents on a rural freeway resulting in a release of the contents is 0.12 accidents per million miles traveled. The average rate of truck accidents on a rural two-lane road is 0.41 accidents per million miles traveled. The sodium cyanide and diesel fuel deliveries are primarily over freeways and the sodium hydroxide deliveries are over two-lane roads and freeway. Using these statistics, the probability of a transportation accident resulting in a release of the three chemicals was evaluated over the proposed extended life of the project:

Sodium Cyanide:
1,020 truck deliveries x haul distance of 143 miles x 0.00000012 accidents per mile traveled = 0.018 total releases

Sodium Hydroxide:
51 truck deliveries x haul distance of 275 miles x 0.00000041 accidents per mile traveled = 0.006 total releases

Diesel Fuel:
1,037 truck deliveries x haul distance of 127 miles x 0.00000012 accidents per mile traveled = 0.016 total releases

The above analysis indicates that the probability of an accident over the extended life of the project during the transport of any of these substances would be low. Sodium hydroxide was evaluated, as if it were to be transported on a rural two-lane road. Since a portion of the actual transportation route is on a freeway, the actual probability of a release is lower than indicated.

All hazardous substances are transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR. Carriers are licensed and inspected, as required by the Nevada Department of Transportation and the USDOT. Tanker trucks have a Certificate of Compliance issued by the Nevada Motor Vehicle Division. These permits, licenses, and certificates are the responsibility of the carrier. Title 49 of the CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and must include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

In the event of a release off the project site, the transportation company would be accountable for response and cleanup. Each transportation company is required to develop a *Spill Prevention, Control, and Countermeasures Plan* to address the materials it would be transporting. Local and regional law enforcement and fire protection agencies also may be involved initially to secure the site and protect public safety. Title 49 of the CFR requires that the carrier notify local emergency response personnel, the National Response Center (for discharge of reportable quantities of hazardous substances to navigable waters), and the USDOT in the event of an accident involving hazardous substances.

Storage and Use

FCMI has developed a *Spill Prevention, Control, and Countermeasure Plan*, which describes the required level of containment and safety measures associated with petroleum products, and an *Emergency Response Plan,* which discusses appropriate actions to be taken in the event of a release. Over the life of the project, the probability of minor spills of materials such as lime and portland cement (from loading/unloading activities at storage silos) or oils and lubricants is relatively high. Operation in accordance with the *Spill Prevention, Control, and Countermeasure Plan* would assist in keeping spills of this nature localized and contained to allow for efficient clean up. FCMI has the necessary spill containment and cleanup equipment available at the site, in addition to trained personnel who are able to quickly respond to minor releases.

Title 40 of the CFR, Part 112 requires that the following measures and actions to be addressed in the *Spill Prevention, Control, and Countermeasure Plan*:

- A prediction of the direction, rate of flow, and total quantity of oil that could be spilled from any point where there is a reasonable potential for equipment failure.

- Construction of appropriate containment and/or diversionary structures, including berms, containment ponds, retaining walls, and collection systems.

- A commitment of manpower and equipment to expeditiously control any harmful quantity of oil discharged.

- A complete discussion of all regulations and procedures that apply to:

    1. Facility drainage;
    2. Bulk storage tanks;
    3. Facility transfer operations, pumping and in-plant processes;
    4. Facility tank truck loading/unloading operations;
    5. Inspections and records;
    6. Security; and
    7. Personnel training requirements.

The *Emergency Response Plan* contains the following information in addition to general information concerning the facility and emergency response procedures:

- A hazard evaluation;

- Response planning levels;

- Facility response training drills/exercises;

- Description of discharge protection systems;

- The identity and telephone number of the designated qualified individual having authority to implement removal activities;

- The identity of individuals to be contacted;

- A description of information to be passed to response personnel;

- A description of response equipment and location;

- A description of response personnel capabilities and duties;

- Evacuation plans as appropriate;

- A description of immediate containment measures; and

- A diagram of the facility.

Hazardous materials storage tanks have secondary containment sufficient to hold 110 percent of the volume of the largest tank within the containment system. Management of all tanks and vessels comply with manufacturer's recommendations, state and Federal regulations, and best management practices.

All hazardous substances are handled in accordance with applicable Mine Safety and Health Administration or Occupational Safety and Health Administration regulations (Titles 30 and 29 of the CFR). The hazardous substances to be used are handled as recommended on the manufacturer's Material Safety Data Sheets. With the above-listed design features and operational practices in place, the probability of a major release occurring at the site is low.

In the event of a major or minor spill occurring on-site, FCMI would follow procedures presented in the *Emergency Response Plan* that establishes procedures for preventing, controlling, and reporting environmental releases within or from facilities located at the site. All spills, including transportation and loading/unloading related spills occurring on-site, are cleaned up or neutralized and reported, as required, to the Nevada Division of Emergency Management, the NDEP, the Bureau of Mining Regulation and Reclamation, the USEPA, the National Response Center, the BLM, and the Humboldt County Department of Public Works.

A release of sodium cyanide solution occurred from the existing heap leach in December 1996. An estimated 52,500 gallons of solution overflowed the leach pad containment and entered an unnamed drainage. To prevent another cyanide solution release off-site from the existing heap leach operation, a series of diversion and containment structures have been constructed capable of containing a release of this nature.

<u>Disposal & Recycling.</u> Non-hazardous solid waste generated on the site is disposed in an approved Class III on-site landfill located within the South Waste Rock Dump. Used tires are either disposed in the landfill or recycled by the suppliers. Several waste streams are produced that are not disposed in the Class III landfill. Assay lab wastes, consisting of lead crucibles, slag, and cupels are produced at the approximate

rate of 9,000 pounds per year and are classified as hazardous waste. The assay lab wastes are shipped to Cominco Metals by an approved hazardous waste hauler for use in smelters as flux material. Liquid waste generated in the laboratory is neutralized and recycled back to the processing circuit. Assay sample pulps and column test waste ores are placed on the heap leach pad. Used petroleum products and antifreeze are transported off-site to approved recycling facilities. All hazardous waste generated at the FCMI mine are sorted, packaged, manifested, and disposed or recycled in compliance with applicable state and Federal regulations.

Effects of a Release

The environmental effects of a release depend on what is released, how much is released, and where it is released. The accident/release statistics previously calculated assume a hazardous material, but do not address volume or location. Potential release scenarios could include a small amount of diesel fuel spilled during transfer operations at the site or the loss of several thousand gallons of sodium hydroxide, diesel fuel, or sodium cyanide into an ephemeral drainage

Sodium hydroxide spilled onto the ground or into a water body has the potential to cause severe short-term damage to localized terrestrial and aquatic habitats. A sodium hydroxide release into a stream or other water body could cause more severe effects, since it has the potential to migrate much farther from the immediate spill site, raise the pH of the water, and potentially result in a reduction in populations of aquatic invertebrates, amphibians, and fish. Base spills, such as sodium hydroxide, may be neutralized by acidic soils.

A release of diesel fuel in high concentrations would damage vegetation and , although unlikely, could ignite and result in a range fire. A spill into a water body would contaminate the water and sediment, possibly impacting local aquatic populations. Because cleanup actions would take place immediately, diesel contamination would not likely result in long-term increases in various hydrocarbons in soils, surface water, or groundwater.

The effects of a sodium cyanide release could be highly variable, much more so than a release of sodium hydroxide or diesel fuel, depending on the volume of the release, the location of the release (e.g., dry upland area, wet meadow area, or flowing stream area), the organisms exposed, and the chemical conditions at the release location. Sodium cyanide solution decomposes rapidly when in contact with the atmosphere and develops poisonous and flammable hydrogen cyanide gas. Environmental effects of a cyanide spill or leak would be limited in extent and time of contamination due to the rapid degradation of cyanide into benign elements when exposed to direct sunlight or oxygen.

A large-scale release of fuel, acid, base, or cyanide could have implications for public health and safety. The location of the release would again be the primary factor in determining its significance. A release in a populated area could have effects ranging from simple inconvenience during cleanup to potential loss of life. The probability of a release anywhere along a transportation route is very small; the probability of a release within a populated area is smaller; and the probability of a release involving an injury or fatality is smaller still. USDOT statistics show that between 1983 and 1992, in the State of Nevada, an average of 0.03 injuries or deaths occurred for each hazardous materials highway incident (USDOT 1993). Based on these statistics, it is not anticipated that a release involving severe effects to human health or safety would occur during the life of the project. None of the process chemicals or fuels to be used in large quantities are carcinogenic; therefore, there would be no increases in cancer risk expected as a result of extension of the mining activity.

The release of a hazardous material or waste into a sensitive area (such as stream, wetland, or populated area) is judged to be highly unlikely. Again, depending on the material released, the amount released, and the location of the release, an accident resulting in a release could impact soils, water, biological resources, and people.

Response to a Release

Sodium hydroxide, diesel fuel, and sodium cyanide are designated as "hazardous substances" for purposes of the release reporting requirements of the CERCLA (40 CFR Table 302.4). All releases of a "reportable quantity" of such hazardous substances must be reported to the National Response Center and the NDEP and Emergency Management. In addition, guidelines used by the NDEP require that areas affected by a release of cyanide be cleaned up until the concentration of cyanide in the soil is less than 0.2 milligram of cyanide per kilogram of soil. FCMI would comply with all provisions of Federal and state law and ensure that all releases of hazardous substances would be reported promptly and thoroughly cleaned up.

In the event of a release en route to the site, the transportation company is responsible for response and cleanup. Law enforcement and fire protection agencies also may be involved to initially secure the site and protect public safety.

Hazardous materials transporters are required to maintain an emergency response plan, which detail the appropriate response, treatment, and cleanup for a material spilled onto land or into water. For example, a release of hydrochloric acid could require neutralizing the spill with lime, flushing the area with water, or removing contaminated soil. Any cleanup would be followed by appropriate reclamation regarding the disturbed area, which could include replacing removed soil and seeding the area to prevent erosion, and the return of the land to its previous use.

3.15.2 Environmental Consequences

3.15.2.1 Proposed Action

The Proposed Action would extend the life of the project, resulting in continuation of the current hazardous materials use practices.

The potential for impacts to the environment exists with the presence of hazardous materials and wastes at the site. Environmental impacts could result from an accidental release of hazardous materials or wastes during transport to or from the site or a release related to use or storage at the site. The criterion for evaluating potential impacts by hazardous materials and wastes is the risk of a spill and resultant impacts to sensitive receptors along transport routes or exposure pathways.

Since the transportation frequency and volume would not change with the Proposed Action no incremental increase in the transportation or use of hazardous materials or wastes would occur. The only additional risks resulting from expansion of the mine is extending the life of the project and transport of the hazardous materials to the new facilities located approximately 0.5 mile further down the frontage road on-site to the proposed South Heap Leach Pad.

As previously discussed, the proposed operation would require continued use and storage of hazardous materials. If some of the chemicals used at the site were to enter the environment in an uncontrolled manner, there could be associated direct or indirect adverse environmental effects. The effects of a release would depend on the substance, quantity, timing, and location of the release. The event could potentially range from a minor petroleum spill on the project site where cleanup equipment is readily available, to a severe release of sodium cyanide solution during transport. Some of the chemicals could have immediate destructive effects on aquatic resources and water quality if a release were to enter a surface water body such as the Humboldt River. A hazardous material or waste release also could seep into the ground and contaminate the local groundwater. Depending on the proximity of such a release to populated areas or water supplies, the use of degraded water for human consumption could affect human health.

As discussed in Section 3.15.1, Affected Environment, over the proposed life of the project the likelihood of a release occurring during transport of hazardous materials to and from the site is low. Although a release of sodium cyanide solution did occur in association with the heap leach operation. The potential for a future release of this nature has been mitigated. The overall potential for a release of hazardous materials in association with transportation, storage, and use at the site is considered to be low. Furthermore, the potential for a release that would result in significant adverse effects to human health or the environment is even lower.

3.15.2.2 North Extension of the Heap Leach Pad Alternative

The North Extension of the Heap Leach Pad Alternative would result in the same impacts as described for the Proposed Action.

3.15.2.3 No Action Alternative

Under the No Action Alternative, none of the transportation, storage, or use of materials described for the Proposed Action would occur.

3.15.3 Cumulative Impacts

Since the potential for accidents involving trucks delivering hazardous materials to the site is low, cumulative impacts resulting from continued shipment of hazardous materials to the Florida Canyon Mine site is minimal. The cumulative effects of using and storing hazardous materials on the project site has been minimized by implementation of a *Spill Prevention, Control, and Countermeasures Plan*, along with the *Emergency Response and Contingency Plan*.

3.15.4 Potential Mitigation Measures

Additional mitigation measures, beyond the protection measures committed to by FCMI and discussed in Section 2.2.13, Hazardous Materials and Wastes, would not be needed.

3.15.5 Residual Adverse Effects

Residual adverse effects from the continued use of hazardous materials on the project site for the Proposed Action would depend on the substance, quantity, timing, location, and response involved in an accidental spill or release. Operation in accordance with the facility's *Spill Prevention, Control and Countermeasures Plan* and prompt cleanup of spills and releases according to the *Emergency Response and Contingency Plan* minimizes the possibility of residual adverse effects due to hazardous materials.

3.16 Relationship Between the Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term is defined as the life of the proposed project through closure and reclamation (2010). Long-term is defined as the future beyond reclamation. Many of the impacts associated with the Proposed Action would be short-term and would cease following successful reclamation. Long-term soil and vegetation productivity under the Alternative is expected to be generally the same as under the Proposed Action. Soils, vegetation, and range resources would be lost from the 19 acres in the pit expansion area.

3.17 Irreversible/Irretrievable Commitment of Resources

Construction and operation of the proposed project would result in either the irreversible or irretrievable commitment of certain resources. Irreversible is a term that describes the loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, livestock forage production from an area is lost while an area is serving as a mining area. The production lost is irretrievable, but the action is not irreversible. If the use changes and the mine is reclaimed, it is possible to resume forage production. Irreversible and irretrievable impacts of the Proposed Action are summarized in Table 3-34.

Table 3-34

Irreversible/Irretrievable Commitment of Resources - Proposed Action

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Geology and Minerals	Yes	Yes	Mineral resources that are mined would no longer be available for future production.
Water Resources and Geochemistry	No	Yes	Water that is removed from the aquifer and Lower Pitt-Taylor Reservoir during the life of the project and used for mine operations would not be available for other uses.
Air Quality	No	No	Emissions from the project would not deteriorate the existing air quality in the project vicinity.
Soils	No	No	Soils from the pit, waste rock dump, heap leach pad area, and other mine facilities would be salvaged for use in reclaiming other areas.
Vegetation Resources	Yes	Yes	Irreversible impacts to 19 acres of vegetation would result from pit expansion.
Wildlife and Fisheries Resources	Yes	Yes	About 19 acres of wildlife habitat would be irreversibly lost.
Special Status Species	No	Yes	About 860 acres of potential habitat (shadscale and sagebrush vegetation type) for the burrowing owl would be irretrievably lost until after reclamation. Approximately 19 acres of potential burrowing owl habitat would be irreversibly lost.
Range Resources	Yes	Yes	About 19 acres would be irreversibly lost for livestock grazing. There would be an irretrievable loss of public land available for livestock grazing, (about 1,100 acres, or 44 animal unit months) until reclamation is sufficient to restore productivity and allow this activity to resume. Forage production is expected to recover in the long-term following reclamation, with a loss of 1 animal unit month.
Land Use and Access	No	No	There would be no irreversible impacts to access; public access patterns would be maintained.

Table 3-34 (Continued)

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Recreation	No	Yes	The 19 acres lost to pit expansion would minimally affect recreation. There would be an irretrievable loss of land available for dispersed recreational opportunities until reclamation is sufficient to allow dispersed recreational activities to resume.
Aesthetics (Visual and Noise Resources)	No	Yes	Visual contrasts during the life of the project would exceed visual resource management objectives. Impacts to visual resources would be eliminated through successful reclamation procedures.
Social and Economic Values	No	Yes	The eventual loss of employment, tax revenues, and other economic benefits following mine closure would be considered temporary over the long-term, as other sources of employment and tax revenues would likely be obtained.
Cultural Resources, Ethnography	Yes	Yes	Disturbance of cultural sites would result in the permanent loss of site context.
Paleontology	No	No	No disturbance to paleontological resources is expected. If paleontological resources are encountered they would be avoided where possible. If avoidance is not possible, irreversible and irretrievable impacts would result.
Hazardous Materials	No	No	A spill of hazardous materials into a sensitive resource, such as a stream or wetland, is not expected during the life of the project. If a spill did occur, impacts could last for several months or years, but would not be considered irreversible. Remediation of a spill would be initiated immediately and would be expected to mitigate most impacts.

4.0 CONSULTATION AND COORDINATION

4.1 Public Participation

The public participation program for this EIS includes the following components.

Two public scoping meetings were held for the EIS, one on January 7 and one on January 8, 1997, in Lovelock and Winnemucca, respectively. The public scoping period for the EIS closed on January 24, 1997.

To date, no written comments have been received by the BLM. The public scoping meeting comments were summarized and included in the EIS Preparation Plan. The following are the key scoping issues for the FCMI Expansion Project.

- Precautions to be taken to prevent cyanide releases;
- Potential realignment of the communications tower access road;
- Use of non-native plant species for reclamation;
- Location of processing areas;
- Depth of proposed pit; and
- Length of time needed to complete the EIS analysis.

4.2 Draft Environmental Impact Statement Preparation

In preparing the Draft EIS, the BLM communicated with and received input from many Federal, state, and local agencies, as well as other organizations and individuals. The following is a list of those who provided input:

Federal Government Agencies

Department of the Interior
Fish and Wildlife Service (Reno)
U.S. Geological Survey (Golden, CO; Carson City, Elko)

State Government Agencies/Universities

Nevada Bureau of Mines and Geology/Mackay School of Mines, University of Nevada, Reno
Nevada Department of Conservation and Natural Resources, Division of Historic Preservation and Archaeology
Nevada Department of Employment, Training, and Rehabilitation, Research, and Analysis Bureau
Nevada Division of Water Resources
Nevada Division of Wildlife (Fallon)
Nevada Human Resources Department
Nevada Natural Heritage Program (Carson City)
Nevada State Demographer's Office, Bureau of Business and Economic Research

Local Governments/Agencies

Northeast Nevada Development Authority
Pershing County Clerks Office
Pershing County Water District
Tri-County Development Authority
Western Nevada Development District

4.3 Draft Environmental Impact Statement Review

Approximately 350 copies of the Draft EIS were distributed by mail to various individuals, organizations, and government agencies. A listing of the agencies, organizations, and individuals who received copies of the Draft EIS in June 1997 is presented below.

Agencies, Organizations, and Individuals Who Received Copies of the Draft Environmental Impact Statement

Government Agencies

HQ-USAF/LEEV - Bolling AFB - Washington, DC
Office of the Deputy A/S of the USAF; Environmental, Safety, Occupational Health - Washington, DC
United States Army Corps of Engineers - San Francisco, CA 94111
United States Department of Energy - Washington, DC
United States Environmental Protection Agency - San Francisco, CA; Washington, DC
USDA, Forest Service - Winnemucca, NV
USDA/NRCS Rangeland Mgmt./Resource Specialist - Winnemucca, NV
USDI/Off. of Environmental Policy & Compliance - Washington, DC
USDI/Natural Resources Library - Washington, DC
USDI/Office of Public Affairs - Washington, DC
USDI/Bureau of Indian Affairs - Elko, NV
USDI/Bureau of Land Management - Reno, NV; Elko, NV; Carson City, NV; Las Vegas, NV; Ely, NV; Battle Mountain, NV; Tonopah, NV; Cedarville, CA; Ridgecrest, CA; Denver, CO; Washington, DC
USDI/Bureau of Land Management, National Applied Resource Science Ctr. - Lakewood, CO
USDI/Fish and Wildlife Service - Washington, DC; Portland, OR; Reno, NV
USDI/USGS - Denver, CO; Carson City, NV; Reston, VA
USDI/Minerals Management Service - Washington, DC
USDI/MMS-RMP - Denver, CO
USDI/National Park Service - Washington, DC
USDI/Office of Surface Mining - Washington, DC

State Agencies

Colorado State University - Fort Collins, CO
State of Nevada Governor's Office - Carson City, NV
Honorable John Marvel, State Assemblyman - Battle Mountain, NV; Carson City, NV
Honorable Dean Rhoads, State Senator - Carson City, NV
State of Nevada Clearinghouse - Carson City, NV
State Planning Coordinator, State of Nevada, Dept. of Administration - Carson City, NV
Nevada Division of Minerals - Carson City, NV
State of Nevada Dept. of Conservation & Natural Resources - Carson City, NV

Nevada Div. of Environmental Protection, Bureau of Mining Regulation and Reclamation - Carson City, NV
Division of State Lands - Carson City, NV
State Engineer, Division of Water Resources - Carson City, NV
Nevada Division of Wildlife - Reno, NV; Fallon, NV; Winnemucca, NV
Historic Preservation Office - Carson City, NV
Nevada Department of Transportation - Winnemucca, NV

Local Agencies

Elko County Library - Elko, NV
Humboldt County Commissioners - Winnemucca, NV
Humboldt County Library - Winnemucca, NV
Humboldt River Water Basin Authority - Carson City, NV
Lander County Commissioners - Battle Mountain, NV 89820
Lander County Library - Battle Mountain, NV
Pershing County Water District - Lovelock, NV
Pershing County Commissioners - Lovelock, NV
Pershing County Library - Lovelock, NV
City of Winnemucca - Winnemucca, NV
Winnemucca City Mgr. - Winnemucca, NV

Elected Officials

Honorable Richard Bryan - Washington, DC
Honorable James Gibbons - Reno, NV
Honorable Harry Reid - Reno, NV
Honorable Paul Vesco, Mayor - Winnemucca, NV

Tribal Organizations

Battle Mountain Band of the Te-Moak Tribe of Western Shoshone - Battle Mountain, NV
Duck Valley Tribal Council - Owyhee, NV
Duckwater Tribal Council - Duckwater, NV
Elko Band of the Te-Moak Tribe of Western Shoshone - Elko, NV
Ft. Hall Shoshone-Bannock - Ft. Hall, ID
Fort McDermitt Tribal Council - McDermitt, NV
Lovelock Paiute Colony - Lovelock, NV
Nevada Indian Environmental Coalition - Reno, NV
South Fork Band of the Te-Moak Tribe of Western Shoshone - Lee, NV
Winnemucca Colony, Western Band of the Western Shoshone - Susanville, CA
Western Shoshone History Preservation Society - Elko, NV
Western Shoshone National Council - Duckwater, NV

Organizations

Animal Protection Institute of America - Sacramento, CA
Audubon Society, Lahontan Chapter - Reno, NV
Center for Urban Affairs and Policy Research - Evanston, IL
Citizen Alert, Native American Program - Reno, NV
Colorado State University - Fort Collins, CO
Desert Research Institute - Reno, NV
Indigenous Affairs International Work Group - Copenhagen DENMARK
Institut fuer Bergbau - Federal Republic of Germany
La Puente Gem and Mineral Club - La Puente, CA
LASER, Inc. - Gridley, CA
McGill University, Department of Geography - Montreal, Quebec CANADA
Mineral Policy Center - Washington, DC
National Wildlife Federation - Portland, OR
National Wildlife Federation - Washington, DC
Nature Conservancy - Reno, NV
Natural Resources Defense Council - Washington, DC
Nevada Cattlemen's Association - Elko, NV
Nevada Mining Association - Reno, NV
Nevada Outdoor Recreation Association - Carson City, NV
Nevada Woolgrower's Association - Elko, NV
Northern Nevada Building Trades Council - Portland, OR
Santa Clara Valley Gem and Mineral Society - San Jose, CA
Sierra Club, Great Basin Group - Reno, NV
Sierra Club, Toiyabe Chapter - Reno, NV
Sierra Club Legal Defense Fund - Denver, CO
Southwest Center for Biological Diversity - Tucson, AZ
Trout Unlimited, Sagebrush Chapter - Reno, NV
University of Nevada - Reno, NV
University of Nevada Libraries - Reno, NV
University of Nevada, Reno, Mackey School of Mines - Reno, NV
Wildlife Society, Nevada Chapter - Elko, NV
Women in Mining - Winnemucca, NV

Industries/Businesses

Agri Beef Company - Boise, ID
American Assay Labs - Sparks, NV
Ballard Spahr Andrews & Ingersoll - Denver, CO
Cordex Exploration Company - Reno, NV
Dames & Moore - Lompac, CA
Echo Bay Minerals Company, McCoy Mine - Battle Mountain, NV
Elko Free Press - Elko, NV
Ellison Ranching Company, Spanish Ranch - Tuscarora, NV
Getchell Gold, Getchell Mine - Golconda, NV
Greystone - Englewood, CO
Happy Creek Land and Cattle Company - Elko, NV
Hecla Mining - Coeur d'Alene, ID
Holme, Roberts & Owen - Denver, CO
Hycroft Mine - Winnemucca, NV

Kinross Goldbanks Mining Co. - Winnemucca, NV
Muys & Pensabene, P.C. - Washington, DC
Nevada Gold Mining Inc. - Winnemucca, NV
Newmont Gold Company - Carlin, NV
Newmont Mining Corporation - Denver, CO
PTI Environmental Services - Bellevue, WA
Pacific Southwest Bioservices - National City, CA
Parsons Behle & Latimer - Salt Lake City, UT
Phelps Dodge Corporation - Lincoln, MT
Phelps Dodge Corporation - Phoenix, AZ
Rayrock Mines, Inc. - Valmy, NV
Sage Engineering - Reno, NV
Santa Fe Pacific Gold Corporation - Golconda, NV
Sierra Pacific Power Company - Reno, NV
Steffen Robertson and Kirsten - Reno, NV
WESTEC - Reno, NV
Western States Mineral Corporation - Reno, NV

Individuals

Scott Benson - Laramie, WY
George Brown - Mead, WA
Robert Brown - Manteca, CA
Brian Buck - Sandy, UT
Rocky Chase - Beatty, NV
Carrie Dann - Crescent Valley, NV
Don and Eddyann Filippini - Battle Mountain, NV
Jack Fullenwider - Golconda, NV
Rodney Gettig - Sacramento, CA
Joe Guild - Reno, NV
Corbin Harney - Battle Mountain, NV
Charlotte and Harvey Healy - Wells, NV
Roger Johnson - Winnemucca, NV
Scott Johnson - Sparks, NV
Paul Kersnowski - Lovelock, NV
Jeanne King - Battle Mountain, NV
Susan Lynn - Reno, NV
Florine Maine - Battle Mountain, NV
Douglas Miller - Carson City, NV
Glenn Miller - Reno, NV
Tom Myers - Reno, NV
Tina Nappe - Reno, NV
Mike & Adrienne Parsons - Imlay, NV
Kenneth Paulsen - Arvada, CO
Jeff Petragilia - Manassas, VA
Belinda Quilici - Lovelock, NV
Larry Reynolds - Carson City, NV
Chris Sewall - Cresent Valley, NV
Marjorie Sill - Reno, NV
Gaylyn Spriggs - Valmy, NV
Debra Struhsacker - Reno, NV

Sharon Sweeney - Winnemucca, NV
Edward S. Syrjala - Centerville, MA
Greg Taylor - Battle Mountain, NV
Rachel Thomas - Huachuca City, AZ
Charlene Toomer - Arlington, VA
Edie Wilson - North New Brunswick, NJ

5.0 LIST OF PREPARERS AND REVIEWERS

5.1 Bureau of Land Management EIS Team

Discipline	Name	BLM Office Location
Project Manager/Social and Economic Values/Air Quality/Noise Resources	Ken Loda	Winnemucca Field Office
NEPA Compliance/ Technical Advisor	Jerry Moritz	Winnemucca Field Office
Geology and Minerals/ Geochemistry/Paleontology	Dave Murphy	Winnemucca Field Office
Water Resources	Craig Drake	Winnemucca Field Office
Land Use and Access	Ken Detweiler	Winnemucca Field Office
Cultural Resources/ Ethnography/Paleontology	Peggy McGuckian	Winnemucca Field Office
Recreation	Lynn Clemons	Winnemucca Field Office
Soils and Vegetation Resources	Michael Zielinski	Winnemucca Field Office
Wildlife and Fisheries Resources/Special Status Wildlife Species	Clarence Covert	Winnemucca Field Office
Range Resources	Ron Pearson	Winnemucca Field Office
Special Status Plants	Leigh Redick	Winnemucca Field Office
Wild Horse and Burro	Nadine Jackson	Winnemucca Field Office
Visual Resources	Mike Bilbo	Winnemucca Field Office
Hazardous Materials	Steve Brooks	Winnemucca Field Office
Water Resources and Geochemistry	Tom Olsen	Nevada State Office
Social and Economic Values	Paul Myers	Nevada State Office

5.2 ENSR EIS Team

Discipline	Name	Degree(s) and Experience
Project Manager	Phil Hackney	B.S. Botany 21 years experience
Senior Review	Drew Ludwig	M.S. Resource Planning and Conservation; B.S., M.S. Zoology; 23 years experience
Project Coordinator/Soils/ Vegetation Resources/Range Resources/Special Status Plants	Jon Alstad	M.S. Range Science; B.S. Animal Science; A.A. Liberal Arts; 9 years experience
Land Use and Access/ Recreation/Aesthetics	Randy Rasmussen	M.S. candidate Natural Resources, Recreation, Tourism B.S. Physical Geography 8 years experience
Water Resources and Geochemistry	Dan Gregory	M.S. Geology B.A. Geology 16 years experience
Project Description/ Coordination	Steve Blazek	B.S. Forest Sciences M.S. Environmental Policy & Mgmt. 5 Years Experience
Cultural Resources/ Ethnography/Paleontology	Karen Caddis-Burrell	B.A. Geography/Anthropology/ Journalism; B.S. Resource Management; 11 years experience
Wildlife and Fisheries Resources/Special Status Wildlife Species	Lori Nielsen	B.S. Wildlife Ecology/ Management; 12 years experience
Air Quality	Vince Scheetz	M.S. Systems Management B.S. Mathematics 22 years experience
Social and Economic Values	Randa Gahin	B.A. Environmental Science Minor City and Regional Planning 3 years experience
Hazardous Materials/ Geology and Minerals	Charlie Allaben	B.S. Civil Engineering 4 years experience

5.2 ENSR EIS Team (Continued)

Discipline	Name	Degree(s) and Experience
Technical Assistance/Surface Water	Dave Graf	M.S. (Pending) Watershed Science B.A. Economics 6 Years Experience
Technical Assistance/ Soils/Vegetation/ Range Resources	Debra Barringer	B.A. Biology/Natural Sciences M.S. (Pending) Terrestrial Ecology 1 Year Experience

5.3 Cooperating Agencies

Nevada Department of Conservation and Natural Resources, Division of Wildlife
U.S. Army Corps of Engineers

6.0 REFERENCES

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Arizona Game and Fish Department. 1993. Bats of Arizona. Arizona Wildlife Reviews.

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GLOSSARY

Alluvium	A general term for all detrital deposits resulting from the operations of modern rivers, including the sediments laid down in riverbeds, floodplains, lakes, and fans at the foot of mountain slopes and estuaries.
Ambient (air)	The surrounding atmospheric conditions.
Aquifer	A stratum of permeable rock, sand, etc, which contains water. Water source for a well.
Archaeology	The science that investigates the history of peoples by the remains belonging to the earlier periods of their existence.
Artifact	Any object showing human workmanship or modification especially from a prehistoric or historic culture.
Attenuate	To lessen, decrease, reduce a concentration.
Clean Water Act	Federal Water Pollution Control Act, as amended.
Contrast	The effect of a striking difference in the form, line, color, or texture of an area being viewed.
Cretaceous	Span of time between 136 and 65 million years ago
Cultural resources	Any site or artifact associated with cultural activities.
Endangered species	Any species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.
Environment	The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.
Ephemeral (drainages)	Flowing in response only to direct precipitation
Erosion	The group of processes whereby earth or rock material is loosened or dissolved and removed from any part of the earth's surface.
Fault	A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.
Fault scarp	Steep rock faces formed by shearing of rock.
Floodplain	That portion of a river valley, adjacent to the river channel, built of sediments and inundated with water at least once every 100 years.

Geology	The science that relates to the earth, the rocks of which it is composed, and the changes that the earth has undergone or is undergoing.
Habitat	A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.
Historic context	Planning document that is used as a cultural resources management tool. It groups information about related important cultural resources based on a specific theme, geographic limits, and chronology with the purpose of providing subsequent identification and framework for evaluation of the eligibility or significance of resources located at a later time in the same area. Historic contexts aid in planning and evaluating future cultural research.
Hydraulic Conductivity	The rate at which a porous medium can transmit water (units of length/time).
Hydrology	The science that relates to the water of the earth.
Impact	A modification in the status of the environment brought about by the Proposed Action.
Intrusive rock	Igneous rock formed within surrounding rock as a result of magma intrusion.
Jurisdictional waters	Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
Landform	A term used to describe the many types of land surfaces that exist as the result of geologic activity and weathering, e.g., plateaus, mountains, plains, and valleys.
Mil	1/1000 inch
Mineralization	Process by which minerals are introduced into a rock, resulting in an economically valuable or potentially valuable deposit.
One-hundred-year flood	A flood with a magnitude that may occur once every 100 years. A 1-in-100 chance of a certain area being inundated during any year.
Paleontology	The science that deals with the life of past geological ages through the study of the fossil remains of organisms.

Paleozoic	Span of time from end of Precambrian to beginning of Mesozoic ranging from about 570 million to 250 million years ago.
Particulate(s)	Minute, separate particles, such as dust or other air pollutants.
pH	The measure of acidity or basicity of a solution.
Physiographic province	Region in which all parts have similar geologic structure and climate and whose landforms differ significantly from those of other regions.
Porphyry	Igneous rock containing phenocrysts in a fine-grained, sugary-textured groundmass.
Precambrian	About 90 percent of geologic time more than 2.5 billion years old; precedes Paleozoic.
Project Area	The area in the immediate vicinity of the Ruby Hill Project.
Raptor	A bird of prey.
Region	A large tract of land generally recognized as having similar character types and physiographic types.
Right-of-way	Strip of land over which the powerline, access road, or maintenance road would pass.
Riparian area	A form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.
Sedimentary rock	Rock resulting from consolidation of loose sediment that has accumulated in layers.
Seismicity	The likelihood of an area being subjected to earthquakes. The phenomenon of earth movements.
Species	A group of individuals of common ancestry that closely resemble each other structurally and physiologically and in nature interbreed producing fertile offspring.
Stratigraphy	Form, arrangement, geographic distribution, chronologic succession, classification, and relationships of rock strata.

Substation	A facility in an electrical transmission system with the capacity to route and control electrical power and to transform power to a higher or lower voltage.
Tectonics	Large-scale structural features of the upper part of the earth's crust.
Tertiary	Span of time between 65 and 3 to 2 million years ago.
Threatened species	Any species likely to become endangered within the foreseeable future throughout all or a significant part of its range.
Transmission line	An electric power line operating at a voltage of 69 kilovolts or greater.
Transmissivity	A measure of the amount of water that can be transmitted horizontally by a porous medium (units of length^2/time).
Tuff	Compacted deposit of volcanic ash and dust that may contain up to 50 percent sediments, such as sand or clay.
Uplift	Structurally high area in the crust produced by an upthrust of rocks.
Visual Resource Management classes	Classification of landscapes according to the kinds of of structures and changes that are acceptable to meet established visual goals (BLM designation).
Wetlands	Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, *Riparian-Wetland Area Management*, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.
Wind rose	A wind rose is a graphical representation of wind direction and wind speed frequencies.

ABBREVIATIONS

μm	micrometers
$\mu g/m^3$	micrograms per cubic meter
ABA	acid-base accounting
ACHP	Advisory Council on Historic Preservation
AGP	acid generating potential
AIRFA	American Indian Religious Freedom Act of 1978
ANP	acid neutralizing potential
APE	Area of Potential Effect
AUM	animal unit month
BLM	Bureau of Land Management
BP	before present
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
cm/s	centimeters per second
CO	carbon monoxide
EIS	environmental impact statement
°F	degrees Fahrenheit
FCMI	Florida Canyon Mining, Inc.
FLPMA	Federal Land Policy and Management Act of 1976
ft^2	square foot
gpd/ft	gallons per day per foot
gpm	gallons per minute
I-80	Interstate 80
kg	kilograms
KOP	Key Observation Point
kV	kilovolts
mg/l	milligrams per liter
mgd	million gallons der day
mph	miles per hour
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards

ABBREVIATIONS (Continued)

NAC	Nevada Administrative Code
NAGPRA	Native American Grave Protection and Repatriation Act of 1990
NDEP	Nevada Department of Environmental protection
NDOW	Nevada Division of Wildlife
NDWR	Nevada Department of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1986
NNHP	Nevada Natural Heritage Program
NNP	net neutralizing potential
NO_2	oxides of nitrogen
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NRHP	National Register of Historic Places
NRS	Nevada Revised Statute
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
ppm	parts per million
PSD	Prevention of Significant Deterioration
RFFA	reasonably foreseeable future action
ROW	right-of-way
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Officer
SMI	Shepherd Miller, Inc.
SO_2	sulfur dioxide
T/kT	tons calcium carbonate per kiloton of sampled material
USCOE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
WSA	Wilderness Study Area

INDEX

APPENDIX A

WATER RESOURCES SUPPLEMENTAL INFORMATION

A1

WHOLE ROCK ANALYSIS RESULTS

Table A1

Summary of Strong Acid Leachable Whole Rock Data in mg/kg for Florida Canyon Mine

Parameters	Detection Limit	1-1 (AL)	5-7 (AL)	1-4 (CLAY)	5-6 (CLAY)	6-5 (CLAY)
Rock Type		ALUV	ALUV	CLAY	CLAY	CLAY
Aluminum		9050	7650	2550	1960	3820
Antimony	0.05	0.396	0.44	0.181	0.143	0.58
Arsenic	0.05	40.6	34.4	2.38	17.2	6.43
Barium	2.5	585	109	25.2	18	28.1
Beryllium	0.05	0.44	0.30	0.255	0.2	<0.05
Bismuth	2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Cadmium	0.05	1.37	0.527	0.1	0.061	0.032
Calcium		7900	5000	1680	1400	256
Chromium	0.05	21.7	19.1	18.7	4.4	5.8
Cobalt	2.5	8.80	10.4	14.6	5.4	<2.5
Copper	1.0	25.2	42.3	43.6	4.4	7
Gallium	0.05	2.6	3.2	1.88	1.5	1.2
Iron		16600	23200	14000	4860	1580
Lead	14.00	33.3	<14	<14	<14	<14
Lithium	2.5	15.40	14.4	4.4	<2.5	<2.5
Magnesium	5	4930	5100	1380	310	98
Manganese	0.5	377	352	62.5	53.5	9.5
Mercury	0.002	0.01	<0.002	<0.002	<0.002	0.03
Molybdenum	0.05	1.9	1.9	0.08	0.1	0.2
Nickel	1	14.4	18.7	36	4.4	2.6
Potassium		1650	1140	292	855	760
Scandium	2.5	<2.5	3.00	<2.5	<2.5	<2.5
Selenium	0.05	<0.05	<0.05	<0.05	<0.05	0.16
Silver	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Strontium	2.5	32.2	33	75	6.7	10.2
Sodium	110.0	2160	498	<110	201.0	220
Thallium	0.20	0.30	0.32	<0.7	<0.7	<0.2
Tin	0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Titanium	2.5	182	197	7.4	10.9	5.5
Vanadium	2.5	27	30.6	5.2	4.8	6.9
Zinc	16.00	87.5	61	106	51	<16

Source: From SMI 1997; Page 1 of 4.

Table A1 (Continued)

Parameters	Detection Limit	1-3 (HEM)	5-1 (HEM)	6-1 (HEM)	6-2 (HEM)	6-3 (HEM)
Rock Type		HEM	HEM	HEM	HEM	HEM
Aluminum		7050	2610	1380	8250	1950
Antimony	0.05	2	0.45	0.218	0.325	1
Arsenic	0.05	41.6	40.0	2.81	16.7	11.4
Barium	2.5	232	54.5	103	40.2	72
Beryllium	0.05	0.78	<0.05	<0.5	0.07	0.17
Bismuth	2.5	<2.5	<2.5	<2.5	4.6	<2.5
Cadmium	0.05	0.33	0.079	0.1	0.079	0.043
Calcium		1120	7400	428	730	284
Chromium	0.05	23.8	6	4.6	198	11.4
Cobalt	2.5	7.60	<2.5	<2.5	4.6	2.6
Copper	1.0	20	4.6	12.4	15.8	5.4
Gallium	0.05	2.4	1.0	0.534	2.5	0.8
Iron		30000	5800	2940	9200	2490
Lead	14	<14	<14	<14	<14	<14
Lithium	2.5	19.20	3.2	<2.5	22.2	<2.5
Magnesium	5	1600	710	140	7000	130
Manganese	0.5	600	112	5.4	26.0	21
Mercury	0.002	0.04	<0.002	<0.002	<0.002	<0.002
Molybdenum	0.05	1.1	1.0	0.78	0.9	0.8
Nickel	1	24.2	1.2	1.5	15.2	<1
Potassium		1600	820	820	368	880
Scandium	2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Selenium	0.05	<0.05	<0.05	<0.05	0.16	<0.05
Silver	0.5	1.10	<0.5	<0.5	1.40	0.65
Strontium	2.5	8.5	37.8	9.1	6.5	6.5
Sodium	110	304	307	482	200.0	182
Thallium	0.20	0.81	<0.2	0.297	<0.2	<0.2
Tin	0.7	0.972	<0.7	<0.7	<0.7	<0.7
Titanium	2.5	15.4	20	6.8	20	5.8
Vanadium	2.5	12.4	9.1	<2.5	24	3.9
Zinc	16	44.5	<16	<16	32.9	<16

Source: From SMI 1997; Page 2 of 4.

Table A1 (Continued)

Parameters	Detection Limit	6-6 (HEM)	1-2 (SIL)	5-2 (SIL)	5-3 (SIL)	5-4 (SIL)
Rock Type		HEM	SIL	SIL	SIL	SIL
Aluminum		2300	6700	4090	3810	5150
Antimony	0.05	0	3.50	5	1.38	2
Arsenic	0.05	8.35	102.0	12.4	36	53.2
Barium	2.5	32.1	56.5	1780	38.2	23.1
Beryllium	0.05	0.31	0.83	<0.050	<0.05	<0.05
Bismuth	2.5	<2.5	<2.5	<2.5	<2.5	2.8
Cadmium	0.05	<0.05	0.138	<0.05	0.036	<0.05
Calcium		334	1120	119	1800	174
Chromium	0.05	0	23	13.2	11.8	28.2
Cobalt	2.5	<2.5	5.1	<2.5	<2.5	<2.5
Copper	1.0	10.4	14	7.3	10.4	33.1
Gallium	0.05	0.7	2.6	1.29	1.1	1.7
Iron		3660	18400	15100	9650	31800
Lead	14	<14	<14	<14	<14	<14
Lithium	2.5	<2.5	20.6	<2.5	<2.5	<2.5
Magnesium	5	111	3000	35.5	207	43.6
Manganese	0.5	13.2	99.5	36	85.0	209
Mercury	0.002	<0.002	0.011	0.02	<0.002	0.04
Molybdenum	0.05	0.1	0.9	2.68	1.3	3.1
Nickel	1	3.2	23.9	1.3	1.2	14.4
Potassium		860	790	274	985	680
Scandium	2.5	<2.5	<2.5	2.7	<2.5	<2.5
Selenium	0.05	<0.05	<0.05	0.36	<0.05	0.37
Silver	0.5	1.40	1.40	1.05	2.85	1.56
Strontium	2.5	9.8	9.8	17.5	21	13
Sodium	110	262	223	<110	312	342
Thallium	0.20	<0.2	0.87	0.166	1.74	0.244
Tin	0.7	<0.7	<0.7	<0.7	<0.7	1.03
Titanium	2.5	7.2	82	75	13.4	18.2
Vanadium	2.5	3.1	3.1	88.5	7.7	7.6
Zinc	16	<16	53.5	<16	<16	<16

Source: From SMI 1997; Page 3 of 4.

Table A1 (Continued)

Parameters	Detection Limit	5-5 (SIL)	6-4 (SIL)	1-5 (SULF)	1-6 (SULF)
Rock Type		SIL	SIL	SULF	SULF
Aluminum		4.68	3620	1200	1530
Antimony	0.05	2	2.00	19.9	5.26
Arsenic	0.05	59.8	17.8	287	129
Barium	2.5	39.8	177	14.2	42.4
Beryllium	0.05	<0.05	0.22	<0.05	0.075
Bismuth	2.5	<2.5	<2.5	<2.5	<2.5
Cadmium	0.05	<0.05	0.14	0.5	0.23
Calcium		355	310	454	630
Chromium	0.05	26.8	6.1	18.4	24.4
Cobalt	2.5	<2.5	<2.5	14.2	5.0
Copper	1.0	3.2	3.2	58.5	15.8
Gallium	0.05	1.4	1.4	1.24	1.7
Iron		23000	5300	10200	12000
Lead	14	<14	<14	<14	<14
Lithium	2.5	<2.5	<2.5	<2.5	<2.5
Magnesium	5	204	174	198	271
Manganese	0.5	150	27.6	17.6	40.4
Mercury	0.002	<0.002	0.013	<0.002	<0.002
Molybdenum	0.05	3.2	0.5	3.87	4.2
Nickel	1	14.2	5.4	20.6	2.8
Potassium		630	1300	425	585
Scandium	2.5	<2.5	<2.5	<2.5	<2.5
Selenium	0.05	0.33	<0.05	34.40	2.54
Silver	0.5	0.50	<0.5	5.40	5.75
Strontium	2.5	12.5	6.2	<2.5	4
Sodium	110	304	268	<110	<110
Thallium	0.20	0.22	0.37	23	7.51
Tin	0.7	1.25	<0.7	<0.7	<0.7
Titanium	2.5	29.2	10	4.4	7.2
Vanadium	2.5	17.9	5.8	6	6.4
Zinc	16	<16	<16	25.3	36.4

Source: From SMI 1997; Page 4 of 4.

A2

ACID-BASE ACCOUNTING RESULTS
(DATA REQUIRING CONSERVATIVE INTERPRETATION)

TABLE A2

ACID-BASE ACCOUNTING TEST RESULTS FOR FLORIDA CANYON MINE

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/ AGP	Quarter/ Year	Elevation	Northing	Easting
BFC-1419: 10-40	ALUV	7.37	0.21	0.02	-	0.19	1.85 (J)	5.94	-4.09	0.31	1/1997	4662.3	50595	50988
BFC-1370: 40-80	ALUV	6.89	0.01	<0.01	-	0.01	3.00	0.31	2.69	9.60	1/1997	4703.7	50154	50284
BFC-1402: 120-160	ALUV	7.83	0.02	<0.01	-	0.02	3.38	0.63	2.76	5.41	1/1997	4634.6	50409.3	50389
BFC-1487: 160-200	ALUV	7.98	0.01	<0.01	-	0.01	3.51 (J)	0.31	3.20	11.2	1/1997	4600.4	49992.2	50321
BFC-1372: 160-200	ALUV	8.38	0.01	<0.01	-	0.01	3.80	0.31	3.49	12.2	1/1997	4620.6	49591.1	50466
BFC-1402: 320-360	ALUV	7.61	0.01	<0.01	-	0.01	4.83	0.31	4.52	15.5	1/1997	4461.4	50409.3	50489
AL - 3	ALUV	7.98	0.08	-	-	0.08	7.50	2.50	5.00	3.00	3/1993	4680	49560	50915
BFC-1701: 80-120	ALUV	6.92	0.02	<0.01	-	0.02	5.63	0.63	5.01	9.01	1/1997	4560.1	51714.7	50745
BFC-1376: 240-300	ALUV	7.42	0.01	<0.01	-	0.01	6.95	0.31	6.64	22.2	1/1997	4540.6	49404.6	50521
AL -4	ALUV	8.58	0.06	0.03	0.01	0.03	10.7	0.94	9.76	11.4	4/1993	4660	49650	50950
AG - 7	ALUV	6.93	0.74	0.66	-	0.08	13.0	2.50	10.5	5.20	1/1992	4780	52000	50500
AL - 8	ALUV	7.06	0.12	0.09	<0.01	0.03	12.3	0.94	11.4	13.1	4/1994	4440	50300	50735
BFC-1564: 280-340	ALUV	8.36	0.01	<0.01	-	0.01	11.9	0.31	11.6	38.1	1/1997	4547.6	49215.6	50374
5-7 (AL)	ALUV	8.33	0.01	<0.01	-	0.01	12.5	0.31	12.2	40.0	1/1997	4565	51549.2	50828
BFC-1564: 120-180	ALUV	8.24	0.04	<0.01	-	0.04	14.9	1.25	13.7	11.9	1/1997	4707.6	49215.6	50374
AG - 2	ALUV	7.80	0.014	0.010	-	<0.01	16.0	<0.31	>15.7	>51.2	1/1992	4340	50500	50850
49400 ALUV	ALUV	7.95	0.074	0.074	-	<0.01	27.0	<0.31	>26.7	>86.4	3/1992	4800	49400	50800
1-1 (AL)	ALUV	7.62	0.07	0.01	-	0.06	31.8	1.88	29.9	17.0	1/1997	4640	49500	50725
BFC-1415: 120-200	ALUV	8.32	0.01	<0.01	-	0.01	30.3 (J)[f]	0.31	30.0	97.0	1/1997	4640.6	49401.7	50621
BFC-1567: 280-340	ALUV	8.52	0.01	<0.01	-	0.01	33.0	0.31	32.7	106	1/1997	4533.3	49045.5	50341
AL - 7	ALUV	8.07	0.26	0.24	0.02	0.02	33.4	0.63	32.8	53.5	3/1994	4460	50300	50700
AG - 8	ALUV	8.93	0.15	0.15	-	<0.01	35.0	<0.31	>34.7	>112	1/1992	4760	52500	50900
AL - 5	ALUV	8.22	0.02	0.02	<0.01	0.01	36.6	0.31	36.3	117	1/1994	4620	49900	50813
BFC-1573: 80-120	ALUV	8.71	0.01	<0.01	-	0.01	55.2	0.31	54.9	177	1/1997	4649	50933.3	50402
71989	ALUV	8.29	0.11	0.1	-	0.01	70.0	0.31	69.7	224	4/1991	4620	51450	50900
AL - 6	ALUV	8.08	0.02	<0.01	<0.01	0.02	71.9	0.63	71.3	115	2/1994	4540	49900	50903
BFC-1570: 80-120	ALUV	7.39	0.02	<0.01	-	0.02	94.1	0.63	93.5	151	1/1997	4559.8	51268	50871
WR - 32	ALUV	8.21	1.02	1	0.13	0.02	105	0.63	104	168	1/1995	4380	50300	50745
WR - 98	CLAY	6.85	0.43	<0.01	0.06	0.43	1.52	13.44	-11.9	0.11	1/1997	4920	50610	52270
BFC-1610: 60-100	CLAY	6.54	0.23	<0.01	-	0.23	1.47	7.19	-5.72	0.20	1/1997	4639.1	52755	51653
WR - 88	CLAY	6.09	0.22	0.02	<0.005	0.2	0.56	6.25	-5.69	0.09	4/1996	4820	52240	54425
WR - 87	CLAY	6.38	0.05	0.01	0.01	0.04	0.30	1.25	-0.95	0.24	4/1996	4820	52010	54935
PT - 20 (duplicate)	CLAY	7.23	0.06	0.03	0.05	0.03	0.20	0.94	-0.74	0.21	3/1994	4460	50300	51330
PT - 20	CLAY	7.40	0.09	0.07	<0.01	0.02	<0.20	0.63	<-0.43	<0.32	3/1994	4460	50300	51330
WR - 44	CLAY	7.37	0.02	<0.01	<0.01	0.02	<0.20	0.63	<-0.43	<0.32	3/1995	4340	50300	51073
PT-15	CLAY	7.43	0.24	0.05	0.07	0.19	6.10	5.94	0.16	1.03	1/1994	4620	49900	51588
WR-82	CLAY	7.90	0.01	<0.01	<0.01	0.01	0.60	0.31	0.29	1.92	3/1996	4860	52195	54448
PT - 24	CLAY	6.21	0.34	0.29	0.03	0.05	2.00	1.56	0.44	1.28	4/1994	4480	51700	51060

Source: SMI 1997; Page 1 of 6

TABLE A2 (Continued)

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/AGP	Quarter/Year	Elevation	Northing	Easting
AG - 3	CLAY	7.57	0.17	0.17	-	<0.01	<1.00	<0.31	0.69	3.20	1/1992	4660	51200	50900
5-6 (CL)	CLAY	7.57	0.04	<0.01	-	0.04	2.22	1.25	0.97	1.78	1/1997	4480	51188.5	51074
WR - 39	CLAY	7.41	0.12	0.04	<0.01	0.08	4.00	2.50	1.50	1.60	2/1995	4360	50300	51260
WR - 51	CLAY	6.65	0.5	0.01	0.05	0.49	17.0	15.3	1.69	1.11	4/1995	4320	50300	51047
WR - 10	CLAY	8.21	0.02	0.02	<0.01	<0.01	2.00	<0.31	>1.69	>6.40	4/1993	4660	48500	51232
PT - 22	CLAY	7.60	0.24	0.1	0.12	0.14	6.36	4.38	1.99	1.45	3/1994	4520	51700	50900
WR - 74	CLAY	8.36	0.06	0.04	0.01	0.02	2.86	0.63	2.24	4.58	2/1996	5000	51929	54714
49400 CLAY	CLAY	7.53	0.20	0.18	-	0.02	3.00	0.63	2.38	4.80	2/1992	4800	49400	50850
WR - 23	CLAY	7.52	0.17	0.11	0.05	0.06	4.38	1.88	2.51	2.34	3/1994	4520	51700	50945
PT - 19	CLAY	7.95	<0.01	<0.01	<0.01	<0.01	3.20	<0.31	>2.89	>10.2	2/1994	4520	50300	51380
WR - 66	CLAY	7.96	0.13	0.1	0.02	0.03	3.97	0.94	3.03	4.23	1/1996	5050	52080	54613
BFC-1672: 200-240	CLAY	7.83	0.01	<0.01	-	0.01	3.39	0.31	3.08	10.8	1/1997	4642.6	52557.7	53246
6-5 (CL)	CLAY	7.37	0.05	<0.01	-	0.05	4.66	1.56	3.10	2.98	1/1997	4740	52459.0	54303
PT - 16	CLAY	7.97	0.13	0.07	0.03	0.06	5.50	1.88	3.63	2.93	1/1994	4620	49500	51632
BFC-1676: 250-280	CLAY	7.87	0.02	<0.01	-	0.02	4.30	0.63	3.68	6.88	1/1997	4843.3	51543.3	53386
WR - 19	CLAY	10.53	<0.01	<0.01	<0.01	<0.01	4.92	<0.31	>4.61	>15.7	2/1994	4540	49900	51010
BFC-1807: 0-40	CLAY	7.73	0.22	<0.01	-	0.22	11.7	6.88	4.83	1.70	1/1997	4706.3	51135	50558
PT - 10	CLAY	7.88	<0.01	<0.01	<0.01	<0.01	5.70	<0.31	>5.39	>18.2	4/1993	4680	48500	51460
1-4 (CL)	CLAY	7.96	0.01	<0.01	-	0.01	5.82	0.31	5.51	18.6	1/1997	4400	50650	50925
AG - 5	CLAY	8.05	0.11	0.10	-	0.01	6.00	0.31	5.69	19.2	1/1992	4560	50300	51700
WR - 31	CLAY	7.68	0.1	0.07	<0.01	0.03	7.00	0.94	6.06	7.47	1/1995	4380	50300	50895
WR - 8	CLAY	8.15	<0.01	-	<0.032	<0.01	7.40	<0.31	>7.09	>23.7	3/1993	4680	49000	51407
WR - 11	CLAY	8.35	0.01	0.01	<0.01	<0.01	7.40	<0.31	>7.09	>23.7	4/1993	4660	49000	51342
AG - 10	CLAY	7.96	0.004	0.004	-	<0.01	12.0	<0.31	>11.7	>38.4	1/1992	4780	48700	51800
WR - 49	CLAY	9.25	0.08	<0.01	<0.01	0.08	18.8	2.50	16.3	7.52	3/1995	4600	52200	51982
71990	CLAY	8.21	0.012	0.01	-	<0.01	57.0	<0.31	>56.7	>182	4/1991	4780	49500	51000
6-2 (HEM)	HEM	7.39	0.95	0.06	-	0.89	4.53	27.8	-23.3	0.16	1/1997	4960	51655.7	53836
PT - 17	HEM	10.04	0.79	0.06	0.01	0.73	3.20	22.8	-19.61	0.14	2/1994	4540	49900.0	51400
5-1 (HEM)	HEM	8.29	0.22	<0.01	-	0.22	1.34	6.88	-5.54	0.19	1/1997	4960	50844.26	52508
WR - 86	HEM	7.26	0.25	0.05	0.04	0.2	1.59	6.25	-4.66	0.25	4/1996	4860	52970	53655
BFC-1418: 20-50	HEM	7.40	0.25	0.07	-	0.18	1.23 (J)	5.63	-4.40	0.22	1/1997	4777.7	49026.8	50662
BFC-1359: 300-350	HEM	6.62	0.14	0.03	-	0.11	<0.20	3.44	<-3.24	<0.06	1/1997	5518.1	50904.8	51823
PT - 6	HEM	8.71	0.16	-	-	0.16	3.19	5.00	-1.81	0.64	3/1993	4680	49000	51170
PT - 12	HEM	7.04	0.25	0.09	0.07	0.16	3.50	5.00	-1.50	0.70	4/1993	4660	49000	51573
WR - 81	HEM	7.05	0.02	<0.01	<0.01	0.02	0.60	0.63	-0.03	0.96	3/1996	4860	52430	54318
WR - 37	HEM	6.96	0.13	<0.01	0.04	0.13	4.06	4.06	0.00	1.00	2/1995	4360	50300	50942
WR - 20	HEM	10.48	0.15	0.03	0.02	0.12	4.29	3.75	0.54	1.14	2/1994	4520	50300	51290
BFC-1592: 40-80	HEM	7.60	0.5	<0.01	-	0.05	2.15	1.56	0.59	1.38	1/1997	5025	52246.9	53706

Source: SMI 1997; Page 2 of 6

TABLE A2 (Continued)

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/ AGP	Quarter/ Year	Elevation	Northing	Easting
WR - 65	HEM	8.08	0.02	0.01	0.01	0.01	1.00	0.31	0.69	3.20	1/1996	5050	52352	54470
WR - 28	HEM	6.25	0.1	0.05	<0.01	0.05	2.33	1.56	0.77	1.49	4/1994	4800	51700	52305
WR - 45	HEM	7.44	0.02	<0.01	<0.01	0.02	1.41	0.63	0.79	2.26	3/1995	4340	50300	51010
BFC-1592: 200-240	HEM	7.70	0.01	<0.01	-	0.01	1.22	0.31	0.91	3.90	1/1997	4865	52246.9	53706
BFC-1594: 120-160	HEM	7.45	0.02	0.01	-	0.02	1.65	0.63	1.03	2.64	1/1997	4896.3	52390.6	53639
WR - 21	HEM	7.49	0.18	0.09	0.07	0.09	4.06	2.81	1.25	1.44	3/1994	4460	50300	51140
49400 HEM	HEM	7.58	0.048	0.038	-	0.01	2.00	0.31	1.69	6.40	2/1992	4800	49400	51000
1-3 (HEM)	HEM	7.73	0.01	<0.01	-	0.01	2.02	0.31	1.71	6.46	1/1997	4480	50133.9	51284
6-1 (HEM)	HEM	6.27	0.03	0.01	-	0.02	2.69	0.63	2.07	4.30	1/1997	5025	51286.9	53508
WR - 97	HEM	7.05	0.04	0.01	<0.01	0.03	3.01	0.94	2.07	3.2	1/1997	4940	50780	52170
BFC-1599: 500-550	HEM	7.87	0.01	<0.01	-	0.01	2.39	0.31	2.08	7.65	1/1997	4491.3	52906.5	53591
BFC-1672: 120-160	HEM	7.78	0.01	<0.01	-	0.01	2.49	0.31	2.18	7.97	1/1997	4722.6	52557.7	53246
WR - 30	HEM	7.55	0.1	0.06	<0.01	0.04	3.45	1.25	2.20	2.76	1/1995	4380	50300	51115
6-3 (HEM)	HEM	8.62	0.01	<0.01	-	0.01	2.54	0.31	2.23	8.13	1/1997	4860	52483.6	53574
48100 HEM	HEM	7.05	0.35	0.33	-	0.02	3.00	0.62	2.38	4.80	2/1992	4780	48100	51300
WR - 96	HEM	6.67	0.02	0.01	<0.01	0.01	2.78	0.31	2.47	8.9	1/1997	4640	52630	54205
WR - 15	HEM	7.26	0.14	0.05	<0.01	0.09	5.40	2.81	2.59	1.92	1/1994	4620	49500	51527
BFC-1670: 400-440	HEM	6.76	0.02	<0.01	-	0.02	3.22	0.63	2.60	5.15	1/1997	4597.5	53123.9	53883
WR - 61	HEM	7.97	0.07	0.05	<0.01	0.02	3.23	0.63	2.61	5.2	1/1996	4825	53270	53370
BFC-1800: 240-280	HEM	7.80	0.01	<0.01	-	0.01	3.14	0.31	2.83	10.05	1/1997	4725.9	52777.9	53331
WR - 69	HEM	8.78	0.26	0.21	0.03	0.05	4.50	1.56	2.94	2.88	2/1996	4800	53463	53193
BFC-1623: 130-200	HEM	7.65	0.01	<0.01	-	0.01	3.64	0.31	3.33	11.6	1/1997	4945.2	51667	53504
BFC-1594: 360-400	HEM	7.91	<0.01	<0.01	-	<0.01	3.69	<0.31	>3.38	>11.8	1/1997	4656.3	52390.6	53639
WR - 12	HEM	8.00	0.08	0.04	0.02	0.04	4.70	1.25	3.45	3.76	4/1993	4660	49000	51255
PT - 11	HEM	7.80	0.08	0.03	0.03	0.05	5.10	1.56	3.54	3.26	4/1993	4680	48500	51142
WR - 18	HEM	8.44	0.23	0.22	<0.01	0.01	3.94	0.31	3.63	12.6	2/1994	4540	49900	51148
WR - 71	HEM	8.81	0.04	0.03	<0.01	0.01	4.14	0.31	3.83	13.2	2/1996	4800	52738	53609
6-6 (HEM)	HEM	8.07	0.03	<0.01	-	0.03	5.21	0.94	4.27	5.56	1/1997	4740	53213.1	54172
WR - 63	HEM	7.77	0.41	0.32	0.03	0.09	7.20	2.81	4.39	2.56	1/1996	4825	52785	53640
WR - 7	HEM	8.36	0.02	-	<0.032	0.02	5.10	0.63	4.48	8.16	3/1993	4680	49000	51288
WR - 89	HEM	7.85	0.22	0.08	<0.005	0.14	9.06	4.38	4.69	2.07	4/1996	4800	53020	53980
AG - 4	HEM	8.36	0.006	0.002	-	<0.01	5.00	<0.31	>4.69	>16.0	1/1992	4500	50150	51300
71988	HEM	7.32	0.20	0.20	-	<0.01	6.00	<0.31	>5.69	>19.2	4/1991	4600	51500	51300
WR - 78	HEM	8.07	0.03	0.01	0.01	0.02	6.34	0.63	5.72	10.1	3/1996	4780	52971	53368
WR - 26	HEM	7.32	0.05	<0.01	<0.01	0.05	7.30	1.56	5.74	4.67	4/1994	4440	50300	50890
PT - 7	HEM	8.12	<0.01	-	0.16	<0.01	6.70	<0.31	>6.39	>21.4	3/1993	4680	49000	51566
PT - 9	HEM	8.31	0.01	-	<0.032	0.01	8.10	0.31	7.79	25.9	3/1993	4700	48500	51520
48100 HEM	HEM	8.10	0.054	0.054	-	<0.01	9.00	<0.31	>8.69	>28.8	3/1992	4780	48100	51000

Source: SMI 1997; Page 3 of 6

TABLE A2 (Continued)

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/ AGP	Quarter/ Year	Elevation	Northing	Easting
AG - 9	HEM	8.02	0.01	0.006	-	<0.01	10.0	<0.31	>9.69	>32.0	1/1992	4800	48400	51600
49400 HEM	HEM	8.28	0.034	0.034	-	<0.01	10.0	<0.31	>9.69	>32.0	3/1992	4800	49400	51250
WR - 13	HEM	8.30	0.01	<0.01	<0.01	0.01	11.2	0.31	10.9	35.8	1/1994	4620	49900	51026
PT - 13	HEM	8.45	0.02	0.02	<0.01	0.01	11.3	0.31	11.0	36.2	4/1993	4660	49000	51194
WR - 9	HEM	8.49	0.02	-	<0.032	0.02	12.7	0.63	12.1	20.3	3/1993	4700	48500	51273
WR - 57	HEM	7.58	0.11	0.01	<0.01	0.1	19.5	3.13	16.4	6.24	4/1995	4980	53000	53676
PT - 23	HEM	7.77	0.05	<0.01	<0.01	0.05	24.8	1.56	23.2	15.9	4/1994	4440	50300	51225
PT - 8	HEM	8.55	0.02	-	<0.032	0.02	28.5	0.63	27.9	45.6	3/1993	4700	48500	51114
5-3 (SIL)	SIL	6.61	3.11	0.5	-	2.61	3.45	81.6	-78.1	0.04	1/1997	4620	52811.5	52705
WR - 24	SIL	7.62	2.5	0.07	2.41	2.43	2.29	75.9	-73.6	0.03	3/1994	4520	51700	51070
WR - 85	SIL	6.77	1.37	0.16	0.03	1.21	0.30	37.8	-37.5	0.01	4/1996	4740	53240	53203
WR - 91	SIL	5.41	1.63	0.39	0.2	1.24	1.80	38.8	-37.0	0.05	1/1997	4360	51700	51590
5-5 (SIL)	SIL	6.35	1.48	0.24	-	1.24	2.90	38.8	-35.9	0.07	1/1997	4440	51483.6	52238
5-4 (SIL)	SIL	5.79	1.17	0.13	-	1.04	4.26	32.5	-28.2	0.13	1/1997	4600	52852.5	51869
5-2 (SIL)	SIL	5.46	0.79	0.06	-	0.73	2.72	22.8	-20.1	0.12	1/1997	4620	53270.5	52787
WR - 72	SIL	6.56	0.68	0.2	0.04	0.48	1.62	15.0	-13.4	0.11	2/1996	5000	52721.0	54260
BFC-1631: 380-420	SIL	4.60	0.51	<0.01	-	0.51	3.01	15.9	-12.9	0.19	1/1997	4674.1	51330.8	53612
WR - 93	SIL	6.91	0.63	0.1	0.02	0.53	4.63	16.56	-11.9	0.28	1/1997	4640	53564	53018
71987	SIL	7.13	1.06	0.19	-	0.87	18.0	27.2	-9.19	0.66	4/1991	4640	52200	51400
BFC-1551: 160-190	SIL	7.11	0.3	0.05	-	0.25	<0.20	7.81	<-7.61	<0.03	1/1997	4768.1	48633.2	50684
WR - 92	SIL	5.94	0.30	0.05	0.21	0.25	1.65	7.81	-6.16	0.21	1/1997	4360	51700	51705
WR - 90	SIL	7.75	0.36	0.05	0.02	0.31	4.42	9.69	-5.27	0.46	4/1996	4800	53310	53805
WR - 29	SIL	7.20	0.78	0.43	0.03	0.35	5.75	10.9	-5.19	0.53	4/1994	4800	51700	52210
WR - 16	SIL	7.50	0.43	0.05	0.04	0.38	8.30	11.9	-3.58	0.70	1/1994	4660	49500	51460
WR - 73	SIL	8.49	0.16	0.07	0.01	0.09	2.15	2.81	-0.66	0.76	2/1996	5000	52128	54599
WR - 94	SIL	6.69	0.20	0.06	0.04	0.14	3.72	4.38	-0.66	0.85	1/1997	4640	53295	53205
WR - 80	SIL	8.58	0.03	<0.01	0.03	0.03	0.35	0.94	-0.59	0.37	3/1996	4840	53515	53700
WR - 95	SIL	6.79	0.10	0.04	0.03	0.06	1.60	1.88	-0.28	0.85	1/1997	4640	53179	56883
BFC-1547: 80-120	SIL	6.77	0.04	<0.01	-	0.03	0.68 (J)	0.94	-0.26	0.73	1/1997	4972.6	51146.9	53337
BFC-1775: 40-80	SIL	6.81	0.1	<0.01	-	0.1	2.87	3.13	-0.26	0.92	1/1997	5136.4	51706.9	54451
WR - 46	SIL	7.85	0.07	<0.01	<0.01	0.07	2.04	2.19	-0.15	0.93	3/1995	4340	50300	50765
WR - 17	SIL	8.64	0.14	0.07	0.06	0.07	2.60	2.19	0.41	1.19	2/1994	4540	49900	51190
WR - 79	SIL	8.11	0.03	0.02	0.02	0.01	0.85	0.31	0.54	2.72	3/1996	4780	53125	53275
PT - 18	SIL	8.57	0.05	0.01	0.01	0.04	2.00	1.25	0.75	1.60	2/1994	4520	50300	50990
BFC-1603: 20-60	SIL	7.51	0.06	<0.01	-	0.06	2.94	1.88	1.07	1.57	1/1997	4964.2	51649.2	53006
WR - 70	SIL	8.38	0.6	0.56	0.02	0.04	2.49	1.25	1.24	1.99	2/1996	4800	53108	53396
WR - 58	SIL	7.45	0.31	0.08	0.01	0.23	8.47	7.19	1.28	1.18	4/1995	4980	53000	53513
AG - 1	SIL	8.18	0.012	0.01	-	<0.01	2.00	<0.31	>1.69	>6.40	1/1992	4300	50300	51000

Source: SMI 1997; Page 4 of 6

TABLE A2 (Continued)

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/ AGP	Quarter/ Year	Elevation	Northing	Easting
BFC-1885: 80-120	SIL	7.18	0.04	<0.01	-	0.04	3.12	1.25	1.87	2.50	1/1997	5062.2	50948.8	53340
WR - 22	SIL	7.75	0.16	0.05	0.09	0.11	5.33	3.44	1.89	1.55	3/1994	4460	50300	50805
WR - 62	SIL	8.37	0.15	0.11	0.01	0.04	3.72	1.25	2.47	2.98	1/1996	4825	53075	53465
BFC-1661: 60-100	SIL	7.34	0.03	<0.01	-	0.03	3.41	0.94	2.47	3.64	1/1997	5019.7	51030.8	53062
WR - 52	SIL	7.25	0.01	<0.01	<0.01	0.01	2.89	0.31	2.58	9.25	4/1995	4320	50300	50836
BFC-1645: 80-120	SIL	7.39	0.02	<0.01	-	0.02	3.29	0.63	2.67	5.26	1/1997	4864.8	51339	52416
BFC-1617: 40-80	SIL	7.27	0.02	<0.01	-	0.02	3.41	0.63	2.79	5.46	1/1997	4904.1	51408.1	52836
BFC-1777: 60-100	SIL	7.76	0.02	<0.01	-	0.02	3.77	0.63	3.15	6.03	1/1997	4859.7	52420.3	53179
BFC-1617: 400-460	SIL	7.92	<0.01	<0.01	-	<0.01	3.98	<0.31	>3.67	>12.7	1/1997	4544.1	51408.1	52836
49400 SIL	SIL	7.97	0.38	0.36	-	0.02	5.00	0.63	4.38	8.00	3/1992	4800	49400	50800
1-2 (SIL)	SIL	9.30	0.01	<0.01	-	0.01	5.14	0.31	4.83	16.4	1/1997	4620	49250	50850
WR - 77	SIL	6.97	0.01	<0.01	<0.01	0.01	5.96	0.31	5.65	19.07	3/1996	4780	53264	53191
6-4 (SIL)	SIL	8.01	0.02	<0.01	-	0.02	8.01	0.63	7.39	12.8	1/1997	4800	53500	53746
AG - 12	SIL	6.71	2.76	2.76	-	<0.01	8.00	<0.31	>7.69	>25.6	1/1992	4780	47750	51650
WR - 64	SIL	8.24	0.28	0.22	0.02	0.06	10.7	1.88	8.83	5.71	1/1996	5025	52940	54138
WR - 14	SIL	8.34	0.01	0.01	<0.01	<0.01	9.50	<0.31	>9.19	>30.4	1/1994	4660	49500	51012
WR - 25	SIL	7.51	0.06	<0.01	<0.01	0.06	11.4	1.88	9.53	6.08	4/1994	4440	50300	51110
WR - 38	SIL	8.01	0.08	0.04	<0.01	0.04	11.9	1.25	10.7	9.52	2/1995	4360	50300	50705
PT - 14	SIL	8.08	<0.01	<0.01	<0.01	<0.01	11.7	<0.31	>11.4	>37.4	1/1994	4620	49500	50818
BFC-1379: 40-80	SIL	8.50	0.01	<0.01	-	0.01	12.9	0.31	12.6	41.3	1/1997	4618.6	49636.2	50716
AG - 11	SIL	7.82	1.26	1.18	-	0.08	17.0	2.50	14.5	6.80	1/1992	4780	48700	50900
WR - 36	SIL	8.28	0.1	<0.01	<0.01	0.1	17.7	3.13	14.6	5.66	1/1995	4700	52200	52060
WR - 43	SIL	7.99	0.1	<0.01	<0.01	0.1	18.6	3.13	15.5	5.95	2/1995	4660	52200	51972
49400 SIL	SIL	7.59	0.004	0.002	-	<0.01	16.0	<0.31	>15.7	>51.2	2/1992	4800	49400	50900
WR - 60	SIL	7.25	0.71	0.59	0.04	0.12	28.7	3.75	25.0	7.65	1/1996	4520	51700	51925
BFC-1406: 80-120	SIL	8.52	0.03	<0.01	-	0.03	27.8	0.94	26.9	29.7	1/1997	4597.2	49789	50589
AG - 13	SIL	8.29	0.02	0.02	-	<0.01	36.0	<0.31	>35.7	>115	1/1992	4780	47850	51675
BFC-1467: 120-200	SIL	8.21	0.02	<0.01	-	0.02	57.1 (J)	0.63	56.5	91.4	1/1997	4616.8	50375.5	50131
AG - 6	SIL	9.34	0.012	0.01	-	<0.01	65.0	<0.31	>64.7	>208	1/1992	4640	51600	50900
1-6 (SULF)	SULF	3.78	0.64	0.11	-	0.53	<0.20	16.6	<-16.4	<0.01	1/1997	4400	50525	50775
1-5 (SULF)	SULF	3.82	0.62	0.19	-	0.43	<0.20	13.4	<-13.2	<0.01	1/1997	4400	50575	50850
BFC-1645: 360-400	SULF	6.84	0.04	<0.01	-	0.04	3.69	1.25	2.44	2.95	1/1997	4584.8	51339	52416
WR - 47	VENT	5.94	3.43	1.67	0.1	1.76	<0.20	55.0	<-54.8	<0.004	3/1995	4600	51700	51540
WR - 67	VENT	5.93	2.38	0.5	0.02	1.88	7.10	58.8	-51.7	0.12	2/1996	4480	51700	51310
WR - 48	VENT	6.16	1.48	0.08	0.11	1.4	<0.20	43.8	<-43.6	<0.005	3/1995	4600	51700	51370
WR - 83	VENT	4.97	1.29	0.18	0.08	1.11	<0.20	34.7	<-34.5	<0.01	4/1996	4400	51700	51568
WR - 75	VENT	5.96	1.08	0.12	0.08	0.96	<0.20	30.0	<-29.8	<0.01	3/1996	4420	51700	51562
WR - 41	VENT	6.64	1.08	0.11	<0.01	0.97	5.80	30.3	-24.5	0.19	2/1995	4680	51700	51840

Source: SMI 1997; Page 5 of 6

TABLE A2 (Continued)

Sample	Rock Type[a]	Paste pH	Total Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Total - HCl Sulfur %	ANP[b] (T/kT)[c]	AGP[d] (T/kT)	NNP[e] (T/kT)	ANP/ AGP	Quarter/ Year	Elevation	Northing	Easting
WR - 34	VENT	6.47	0.8	0.01	<0.01	0.79	<0.02	24.7	<-24.5	<0.01	1/1995	4700	51700	51548
WR - 33	VENT	7.84	0.88	<0.01	<0.01	0.88	3.90	27.5	-23.6	0.14	1/1995	4700	51700	51760
WR - 84	VENT	6.17	0.87	0.28	<0.005	0.59	<0.20	18.4	<-18.2	<0.01	4/1996	4400	51700	51723
PT - 21 (duplicate)	VENT	6.44	1.41	0.73	1.33	0.68	6.10	21.3	-15.2	0.29	3/1994	4520	51700	51305
WR - 68	VENT	6.24	0.98	0.29	0.03	0.69	14.7	21.6	-6.86	0.68	2/1996	4480	51700	51840
WR - 35	VENT	6.97	0.29	0.22	0.05	0.07	<0.02	2.19	<-1.99	<0.09	1/1995	4700	52200	51675
PT - 21	VENT	6.11	1.31	1.06	0.22	0.25	6.10	7.81	-1.71	0.78	3/1994	4520	51700	51305
WR - 76	VENT	7.45	0.03	0.01	0.01	0.02	<0.20	0.63	<-0.43	<0.32	3/1996	4420	51700	51740
WR - 42	VENT	7.38	0.15	0.07	<0.01	0.08	3.70	2.50	1.20	1.48	2/1995	4660	52200	51755
WR - 53	VENT	6.45	0.95	0.07	0.1	0.88	29.9	27.5	2.40	1.09	4/1995	4560	51700	51372
WR - 54	VENT	6.78	0.03	0.01	<0.01	0.02	3.80	0.63	3.18	6.08	4/1995	4660	51700	51458
WR - 50	VENT	8.10	0.06	<0.01	<0.01	0.06	5.85	1.88	3.98	3.12	3/1995	4600	52200	51780
WR - 59	VENT	7.40	0.4	0.34	0.03	0.06	9.18	1.88	7.31	4.90	1/1996	4520	51700	51292
WR - 27	VENT	6.32	2.84	2.35	0.49	0.49	24.4	15.3	9.09	1.59	4/1994	4480	51700	51405
WR - 40	VENT	7.92	0.14	<0.01	<0.01	0.14	17.2	4.38	12.8	3.93	2/1995	4680	51700	51603
WR - 56	VENT	7.13	0.04	<0.01	<0.01	0.04	19.3	1.25	18.1	15.4	4/1995	4680	52200	51873
WR - 55	VENT	6.50	0.38	0.06	<0.01	0.32	32.1	10.0	22.1	3.21	4/1995	4680	52200	51767
PT - 25	VENT	6.20	0.99	0.93	<0.01	0.06	34.1	1.88	32.2	18.2	4/1994	4480	51700	51840

[a] ALUV = alluvium
CLAY = clay-altered siltstone
HEM = hematitic siltstone
SIL = siliceous siltstone
SULF = sulfidic siltstone
VENT = sulfur vent

[b] ANP = Acid Neutralization Potential
[c] T/kT = Tons $CaCO_3$/kton rock
[d] AGP = Acid Generation Potential
[e] NNP = Net Neutralization Potential (ANP-AGP)
[f] J = estimated value based on QA/QC results

Source: SMI 1997; Page 6 of 6

A3

ACID-BASE ACCOUNTING RESULTS FOR REANALYZED SAMPLES

Table A3

Acid-Base Accounting Results for Re-Analyzed Samples (from SMI 1997)

Sample	Rock Type	Total Sulfur %	Hot H_2O Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Residual Sulfur %	ANP (T/kT)	AGP[1] (T/kT)	NNP (T/kT)	ANP/ AGP
AL 1-1	ALUV	0.18	0.06	< 0.01	< 0.01	0.12	26	0.31	25.7	83.2
AL-3 "B"	ALUV	0.04	0.02	< 0.01	< 0.01	0.02	21	0.31	20.7	67.2
BFC-1419:10-40	ALUV	0.26	0.05	< 0.01	< 0.01	0.21	2	0.31	1.69	6.40
BFC-1564: 120-18	ALUV	0.07	0.03	< 0.01	0.01	0.03	13	0.31	12.7	41.6
Average		**0.14**	**0.04**	**< 0.01**	**< 0.01**	**0.10**	**15.5**	**0.3**	**15.2**	**49.6**
BFC-1610: 60-100	CLAY	0.29	0.04	< 0.01	0.01	0.24	1	0.31	0.69	3.20
BFC-1807: 0-40	CLAY	0.27	0.03	< 0.01	0.09	0.15	8	2.81	5.19	2.84
WR-51	CLAY	0.57	0.04	0.04	0.03	0.46	13	0.94	12.1	13.9
WR-88	CLAY	0.23	0.02	< 0.01	0.01	0.2	9	0.31	8.69	28.8
WR-98	CLAY	0.53	0.10	< 0.01	0.02	0.41	1	0.63	0.38	1.60
Average		**0.38**	**0.05**	**< 0.02**	**0.03**	**0.29**	**6.4**	**1.0**	**5.4**	**6.4**
HEM 5-1	HEM	0.19	0.02	< 0.01	0.05	0.12	19	1.56	17.4	12.2
HEM 6-2	HEM	0.95	0.07	< 0.01	0.10	0.78	5	3.13	1.88	1.60
BFC-1418: 20-50	HEM	0.3	0.04	0.02	0.04	0.2	2	1.25	0.75	1.60
PT-17 "B"	HEM	0.39	0.10	0.03	< 0.01	0.26	9	0.31	8.69	28.8
WR-86	HEM	0.32	0.03	0.02	0.10	0.17	5	3.13	1.88	1.60
WR-89	HEM	0.22	0.07	< 0.01	< 0.01	0.15	20	0.31	19.7	64.0
Average		**0.40**	**0.06**	**< 0.02**	**< 0.05**	**0.28**	**10.0**	**1.6**	**8.4**	**6.2**
5-2	SIL	0.97	0.03	0.09	0.06	0.79	1	1.88	-0.88	0.53
5-3	SIL	3.61	0.22	0.12	0.17	3.10	9	5.31	3.69	1.69
5-4	SIL	1.42	0.16	0.09	0.15	1.02	24	4.69	19.3	5.12
5-5	SIL	1.6	0.09	0.06	0.19	1.26	7	5.94	1.06	1.18
BFC-1551: 160-19	SIL	0.32	0.06	< 0.01	0.06	0.20	1	1.88	-0.88	0.53
BFC-1631: 380-42	SIL	0.55	0.01	0.05	0.45	0.04	1	14.1	-13.1	0.07
WR-16 "B"	SIL	0.28	0.08	0.04	0.03	0.13	13	0.94	12.1	13.9
WR-24 "B" [1]	SIL	0.22	0.09	0.02	< 0.01	0.11	9	0.31	8.69	28.8
WR-29	SIL	-	-	-	-	-	-	-	-	-
WR-58	SIL	0.37	0.07	0.04	0.14	0.12	40	4.38	35.6	9.14
WR-72	SIL	0.76	0.06	0.09	0.09	0.52	1	2.81	-1.81	0.36
WR-85	SIL	0.52	0.04	0.03	0.06	0.39	3	1.88	1.13	1.60
WR-90	SIL	0.65	0.05	0.01	0.04	0.55	26	1.25	24.8	20.8
WR-91	SIL	1.75	0.15	0.06	0.12	1.42	1	3.75	-2.75	0.27
WR-92	SIL	0.34	0.02	0.01	0.07	0.24	1	2.19	-1.19	0.46
WR-93	SIL	0.73	0.16	< 0.01	0.06	0.51	5	1.88	3.13	2.67
WR-94	SIL	0.2	0.05	< 0.01	0.06	0.09	1	1.88	-0.88	0.53
Average		**0.94**	**0.08**	**< 0.05**	**0.12**	**0.69**	**8.9**	**3.6**	**5.3**	**2.5**
1-5	SULF	0.63	0.16	0.01	0.43	0.03	1	13.4	-12.4	0.07
1-6	SULF	1.11	0.1	< 0.01	0.89	0.12	1	27.8	-26.8	0.04
BFC-1645: 360-40	SULF	0.05	0.01	0.01	0.03	< 0.01	1	0.94	0.06	1.07
Average		**0.60**	**0.09**	**< 0.01**	**0.45**	**0.05**	**1.0**	**14.1**	**-13.1**	**0.1**
PT-21	VENT	1.61	0.07	0.22	< 0.01	1.32	1	0.31	0.69	3.20
WR-27 "B"	VENT	0.56	0.08	0.11	< 0.01	0.37	11	0.31	10.7	35.2
WR-33	VENT	1.1	0.13	0.05	< 0.01	0.92	1	0.31	0.69	3.20
WR-34 "B"	VENT	1.14	0.20	0.19	< 0.01	0.75	13	0.31	12.7	41.6
WR-40	VENT	0.13	0.05	0.03	< 0.01	0.05	13	0.31	12.7	41.6
WR-41	VENT	1.19	0.11	0.05	< 0.01	1.03	6	0.31	5.69	19.2
WR-47	VENT	2.12	0.17	0.07	0.05	1.83	1	1.56	-0.56	0.64
WR-48	VENT	1.6	0.14	0.02	0.15	1.29	1	4.69	-3.69	0.21
WR-53	VENT	1.17	0.14	0.21	< 0.01	0.82	24	0.31	23.7	76.8
WR-55	VENT	0.44	0.05	0.04	0.07	0.28	25	2.19	22.8	11.4

Table A3 (Continued)

Sample	Rock Type	Total Sulfur %	Hot H_2O Sulfur %	HCl Sulfur %	HNO_3 Sulfur %	Residual Sulfur %	ANP (T/kT)	AGP[1] (T/kT)	NNP (T/kT)	ANP/ AGP
WR-67	VENT	2.8	0.21	0.11	0.08	2.40	17	2.50	14.5	6.80
WR-68	VENT	0.96	0.07	0.10	< 0.01	0.79	18	0.31	17.7	57.6
WR-75	VENT	1.14	0.08	0.07	0.04	0.95	1	1.25	-0.25	0.80
WR-83	VENT	1.26	0.16	0.20	< 0.01	0.90	24	0.31	23.7	76.8
WR-84	VENT	0.45	0.07	0.13	< 0.01	0.25	13	0.31	12.7	41.6
Average		**1.18**	**0.12**	**0.11**	**< 0.03**	**0.93**	**11.3**	**1.0**	**10.2**	**11.0**
Alunite	alunite	1.37	0.29	0.22	< 0.01	0.86	9	0.31	8.69	28.8
Alunite - DUP	alunite	1.35	0.27	0.23	< 0.01	0.85	8	0.31	7.69	25.6
Alunite - TRIP	alunite	1.34	0.27	0.21	< 0.01	0.86	7	0.31	6.69	22.4
Average		**1.35**	**0.28**	**0.22**	**< 0.01**	**0.86**	**8.0**	**0.3**	**7.7**	**25.6**

[1] WR-24 and WR-24 "B" were not included in the SIL averages due to the large difference in total sulfur values between the two supposedly similar samples

A4

PERMITTED WATER RIGHTS AND SUPPLY WELLS IN THE VICINITY OF FLORIDA CANYON MINE

Table A4

Permitted Water Rights and Supply Wells in the Vicinity of Florida Canyon Mine

APP #	Filing Date	Owner/Description	Section, Township, and Range	Diversion rate (cfs)	Annual Duty[1]	Use/Comments
1054	6/22/12	NV Humboldt Mining Co.	SE1/4 S12, T31N, R33E	0.025		From Florida Canyon Spring; Presumed Abandoned
3473	6/29/15	James, T.H.	SESW S12, T32N, R33E	0.26	78.0 afa	Irrigation
4342	3/3/17	Campbell, Clayton C.; Campbell, Clifford D.; Mercer, J.D.	NWSE S35, T32N, R33E	1.15	344.85 afa	Irrigation
2716	12/16/18	Adamson, W.G.	S30 & S31, T31N, R34E	1.002		Power, Mining and Milling, Domestic
1616	5/26/19	Taylor, John G.	NW S03, T30N, R33E	1.26		Irrigation
9901	8/19/37	Lindgren and Swinnereton	NWSE S36, T31N, R33E	0.1		Mining and Milling
13333	3/23/50	Campbell, Cecil G.; Campbell, Clifford D.	SESE S28, T32N, R33E	3.12	155.84 afa	Irrigation
12951	4/23/56	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	6.3	1282 afa	Reservoir Storage; Multiple Use
12953	4/23/56	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	20.1	4154.1 afa	Reservoir Storage; Multiple Use
12956	4/3/57	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	5000	100000 afa	Reservoir Storage; Multiple Use
12949	7/3/57	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	13.5	2626.3 afa	Reservoir Storage; Multiple Use
12950	7/3/57	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	9.9	3023.5 afa	Reservoir Storage; Multiple Use
12955	3/5/59	US Department of Interior, Bureau of Reclamation	Rye Patch Reservoir	91.5	14432 afa	Reservoir Storage; Multiple Use
19668R02	3/14/61	State of Nevada	NESE S21, T30N, R33E	0.697	197.97 afa	Irrigation
19668R03	3/14/61	State of Nevada	NESE S21, T30N, R33E	0.258	73.39 afa	Irrigation
19668	3/14/61	Nevada Pershing LLC; R.J.B. Development CO.; State of Nevada	NWSE S21, T30N, R33E	3.023	859.12 afa	Irrigation
31850	5/27/77	Rye Patch Limited	SESE S21, T31N, R33E	5	1179.58 mga	Industrial

[1] afa - acre-feet per year;
mga - million gallons per year.

Table A4 (Continued)

APP #	Filing Date	Owner/Description	Section, Township, and Range	Diversion rate (cfs)	Annual Duty[1]	Use/Comments
54742	5/10/90	Rye Patch Ranch Association	SWNW S17, T30N, R33E	1	4.4 mga	Quasi-municipal
57096	1/17/92	Pegasus Gold Corporation	NENW S03, T31N, R33E	0.1	10.68 mga	Mining and Milling
58265	10/23/92	Nevada Division of Wildlife	NENE S18, T30N, R33E	0.317	116.73 afa	Wildlfie
60415	8/30/94	Trainor, Harry D. Sr; Trainor, Trudy I.	SWSW S09, T30N, R33E	0.03	0.56 afa	Quasi-municipal
60881	1/31/95	Rye Patch Limited Partnership	SWSE S21, T31N, R33E	2.5		Industrial
60882	1/31/95	Rye Patch Limited Partnership	SENW S28, T31N, R33E	2.5		Industrial
60883	1/31/95	Rye Patch Limited Partnership	SWNE S28, T31N, R33E	2.5		Industrial
60884	1/31/95	Rye Patch Limited Partnership	NWNE S28, T31N, R33E	2.5		Industrial
61116	4/7/95	Wyoming Mining Association	LT4 S24, T32N, R33E	0.56	110.5 afa	Mining and Milling
61203	5/4/95	Pegasus Gold Corporation	NENW S03, T31N, R33E	0.11	25.95 mga	Mining and Milling
61707	11/27/95	Pegasus Gold Corporation	NESES34, T32N, R33E	0.1	23.59 mga	
61723	12/1/95	Nevada Pershing LLC	E/2 S02, T30N, R33E	2		Quasi-municipal
61918	2/21/96	Kampgrounds of America Inc.; Nevada Pershing	NENW S17, T30N, R33E	1	4.32 mga	Quasi-municipal
62380T	8/13/96	Pegasus Gold Corporation	SENW S03, T31N, R33E	0.21	49 mga	Mining and Milling
62381T	8/13/96	Pegasus Gold Corporation	NENW S03, T31N, R33E	0.25	59 mga	Mining and Milling
62382T	8/13/96	Pegasus Gold Corporation	SWSW S02, T31N, R33E	0.34	80 mga	Mining and Milling
62383T	8/13/96	Pegasus Gold Corporation	NWNW S11, T31N, R33E	0.09	21 mga	Mining and Milling

Source: Nevada Division of Water Resources, Water Rights Database

[1] afa - acre-feet per year;
mga - million gallons per year.

Table A4 (Continued)

APP #	Filing Date	Owner/Description	Section, Township, and Range	Diversion rate (cfs)	Annual Duty[1]	Use/Comments
34659	11/29/77	Western State Geothermal Company	NESW S15, T31N, R33E	10	3620 afa	Industrial
10283	8/30/78	United States	NE S18, T30N, R33E	5000	15152.32 afa	Reservoir Storage;
45643	5/10/82	Western State Geothermal Company	NENW S02, T31N, R33E	5	723.9 afa	Other
36406	8/16/82	Nevada State Division of Parks	SENE S18, T30N, R33E	0.0557	0.307 mga	Recreation and
48518	10/25/84	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Company	SESE S34, T31N, R33E	0.5		Domestic
48515	10/25/84	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Co.	SWSW S23, T30N, R33E	2.1		Quasi-municipal
48514	10/26/84	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Co.	SWSW S12, T30N, R33E	1		Quasi-municipal
48519	10/26/84	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Co.	NWSE S35, T30N, R33E	1		Quasi-municipal
48516	10/26/84	R.J.B. Development; Clendenen, Ralph; Campbell, Charlotte	Buffalo Creek	0.75		Quasi-municipal
48980	4/11/85	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Company	SESE S11, T30N, R33E	1		Quasi-municipal
48982	4/11/85	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Company	SWSW S01, T30N, R33E	0.75		Quasi-municipal
48981	4/11/85	Campbell, Charlotte; Clendenen, Ralph; R.J.B. Development Co.	SESW S26, T30N, R33E	1		Quasi-municipal
48999	4/19/85	Pegasus Gold Corporation	SWNW S03, T31N, R33E	0.29	14.53 mga	Mining and Milling
19668R01	8/12/85	State of Nevada	NESE S21, T30N, R33E	1.12	290.32 afa	Irrigation
49931	6/18/86	Pegasus Gold Corporation	NWNW S11, T31N, R33E	0.8	0.75 mga	Mining and Milling
49952	6/30/86	Nevada Pershing LLC	SWNW S17, T30N, R33E	0.19	0.37 mga	Quasi-municipal
50061	8/12/86	Campbell, Charlotte M.	SENW S34, T32N, R33E	0.045	1.02 mga	Quasi-municipal
50062	8/12/86	Campbell, Charlotte M.	SENW S34, T32N, R33E	0.15	3.29 mga	Quasi-municipal
50248	10/6/86	Campbell, Charlotte M.	SWNW S34, T32N, R33E	0.19	1.41	Quasi-municipal
50716	3/20/87	Nevada Division of Parks	NWNE S18, T30N, R33E	0.12	0.56 mga	Recreation
50717	3/20/87	Conservation and Natural Resources	SENE S18, T30N, R33E	0.056	0.54 mga	Recreation
50773	4/2/87	Burns Brothers Inc.	SWNW S16, T30N, R33E	0.049	1.31 mga	Commercial
53342	6/2/89	Pegasus Gold Corporation	SWNW S03, T31N, R33E	0.3	14.53 mga	Mining and Milling

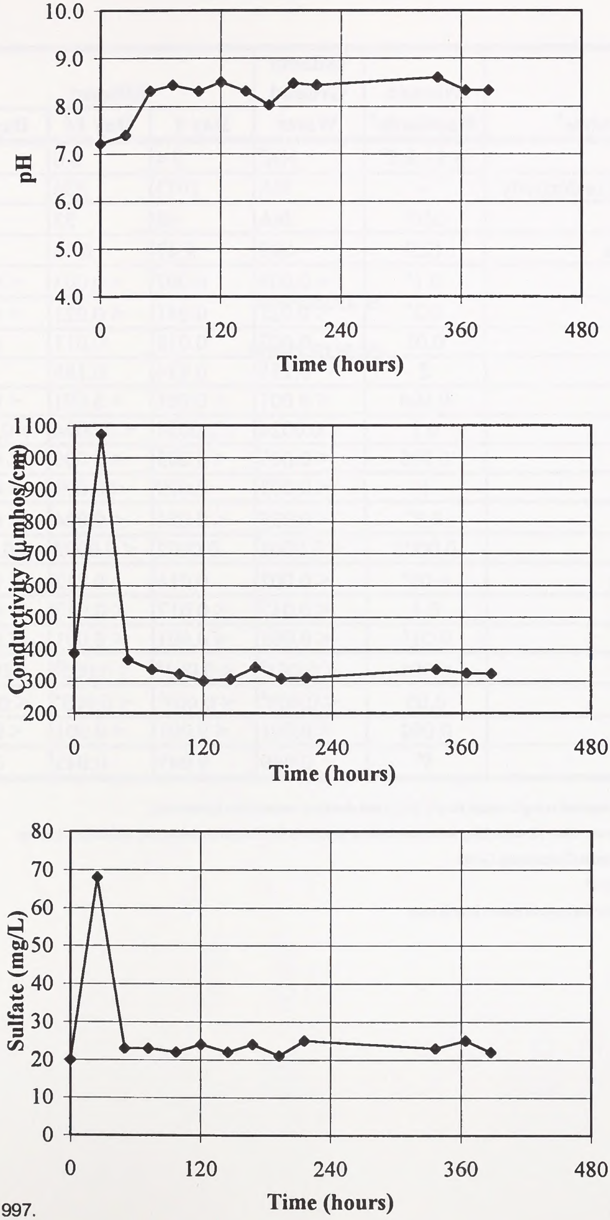
[1] afa - acre-feet per year;
mga - million gallons per year.

A5

COLUMN TEST RESULTS

Figure A5

Graphs of pH, Electrical Conductivity, and Sulfate for the Column Test of Pit Backfill



Source: SMI 1997.

June 1997

Table A5

Chemical Analysis of Influent and Effluent Water for Column Test of Pit Backfill

Analyte[a]	Nevada Standards[b]	Influent Ground Water	Effluent		
			Day 1	Day 14	Day 16
pH	6.5 - 8.5[c]	NA[d]	7.4	8.6	8.3
Electrical Conductivity	-	NA	1073	336	324
Sulfate	250[c]	NA	68	23	22
Magnesium	125[c]	4.49	9.47	6.76	7.08
Silver	0.1[c]	< 0.003	0.007	< 0.003	< 0.003
Aluminum	0.2[c]	< 0.021	0.041	< 0.021	< 0.021
Arsenic	0.05	0.007	0.018	0.011	0.029
Barium	2	0.155	0.934	0.185	0.12
Beryllium	0.004	< 0.001	< 0.001	< 0.001	< 0.001
Chromium	0.1	< 0.0024	< 0.0024	< 0.0024	< 0.0024
Cadmium	0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper	1	< 0.003	0.009	< 0.003	< 0.003
Iron	0.3[c]	< 0.024	< 0.024	< 0.024	< 0.024
Mercury	0.0002	< 0.0002	0.0002	< 0.0002	< 0.0002
Manganese	0.05[c]	< 0.002	0.014	0.232	0.496
Nickel	0.1	< 0.017	< 0.017	< 0.017	< 0.017
Lead	0.015	< 0.001	< 0.001	< 0.001	< 0.001
Antimony	0.006	< 0.003[e]	< 0.003[e]	< 0.003[e]	< 0.003[e]
Selenium	0.05	< 0.003[e]	< 0.003[e]	< 0.003[e]	< 0.003[e]
Thallium	0.002	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	5[c]	0.069	0.045	0.043	0.072

[a] All analytes are reported in mg/L except for pH (S.U.) and electrical conductivity (μmhos/cm)

[b] Standards shown are either EPA drinking water standards or standards for Nevada domestic use, whichever is lower.

[c] Secondary Maximum Contaminant Levels

[d] NA = Not Analyzed

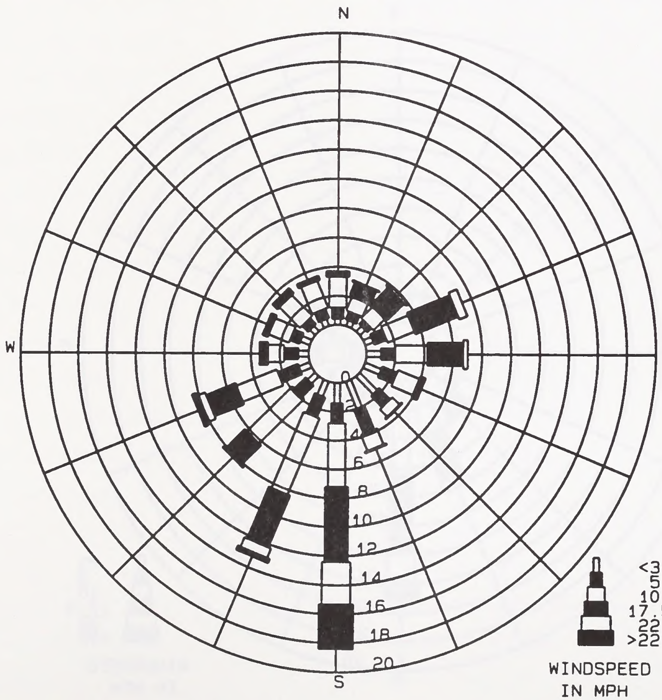
[e] Elevated detection limit due to matrix interference

APPENDIX B

WIND ROSES

FLORIDA CANYON MONITORING PROGRAM
WIND ROSE ANALYSIS (PERCENT)
1/ 1/96 through 12/31/96
10 METER DATA

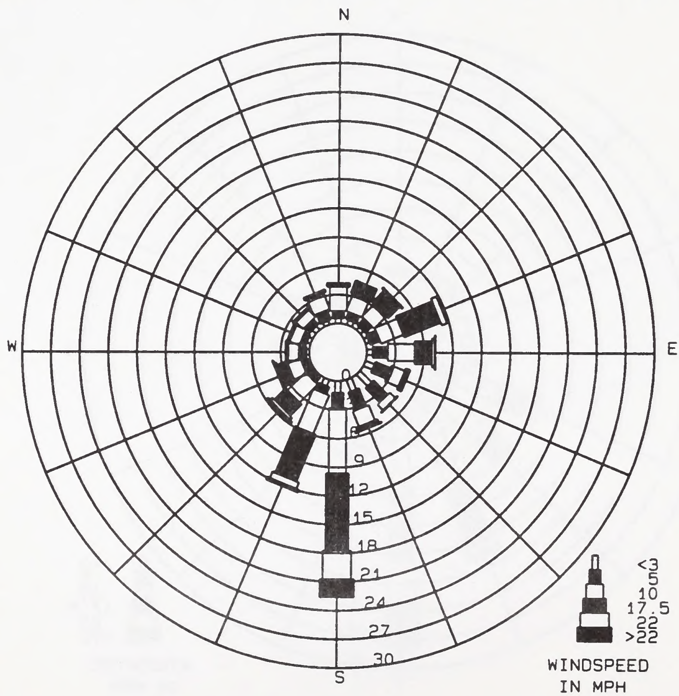
WIND DIRECTION	WIND SPEED (MI/HR) <= 3	<= 5	<= 10.0	<=17.5	<=22.0	>22.0	TOTAL	AVG SPEED
N	0.40	0.80	2.10	0.40	0.00	0.00	3.6	6.6
NNE	0.40	0.60	1.10	0.90	0.10	0.00	3.0	7.8
NE	0.50	0.40	1.20	1.60	0.20	0.00	3.9	9.3
ENE	0.60	0.90	2.00	3.20	0.60	0.00	7.3	10.3
E	1.00	1.00	2.20	2.50	0.30	0.00	7.0	8.8
ESE	1.20	1.10	1.60	0.40	0.00	0.00	4.2	5.3
SE	1.70	1.10	0.70	0.10	0.00	0.00	3.7	4.0
SSE	2.00	1.80	1.20	0.10	0.00	0.00	5.1	4.0
S	1.40	1.40	4.40	5.20	2.90	3.10	18.4	13.7
SSW	1.10	1.50	5.70	3.90	0.70	0.30	13.3	9.3
SW	0.70	1.10	4.40	1.90	0.10	0.00	8.3	8.0
WSW	0.80	1.50	3.00	2.20	0.60	0.30	8.4	9.3
W	0.70	1.00	1.10	0.60	0.00	0.00	3.4	6.4
WNW	0.70	0.70	1.50	0.40	0.00	0.00	3.3	6.1
NW	0.50	0.60	2.00	0.50	0.00	0.00	3.6	6.7
NNW	0.50	0.70	2.00	0.30	0.00	0.00	3.5	6.4
CALM	0.00							
TOTAL	14.20	16.20	36.10	24.10	5.60	3.80	100.00	



FLORIDA CANYON MINE 1996 Wind Rose

FLORIDA CANYON MONITORING PROGRAM
WIND ROSE ANALYSIS (PERCENT)
1/ 1/95 through 12/31/95
10 METER DATA

WIND DIRECTION	WIND SPEED (MI/HR) <= 3	<= 5	<= 10.0	<=17.5	<=22.0	>22.0	TOTAL	AVG SPEED
N	0.50	0.80	2.50	0.40	0.00	0.00	4.2	6.5
NNE	0.50	0.80	1.90	1.40	0.00	0.00	4.6	7.9
NE	0.40	1.00	1.80	1.70	0.20	0.00	5.0	8.8
ENE	0.40	1.10	2.50	4.10	0.60	0.00	6.6	10.4
E	0.60	1.60	2.80	1.80	0.30	0.10	7.2	8.2
ESE	1.00	1.70	1.50	0.50	0.00	0.00	4.7	5.4
SE	1.70	2.10	0.80	0.10	0.00	0.00	4.7	3.9
SSE	1.30	2.00	1.70	0.40	0.10	0.00	5.4	5.4
S	1.20	1.60	6.80	8.10	3.00	1.90	22.6	12.3
SSW	0.70	0.80	4.30	5.30	0.70	0.30	12.2	10.7
SW	0.20	0.70	2.60	1.70	0.30	0.20	5.8	9.8
WSW	0.20	0.70	1.40	1.10	0.20	0.10	3.7	9.2
W	0.30	0.80	1.10	0.30	0.00	0.00	2.6	6.6
WNW	0.40	0.60	1.10	0.30	0.00	0.00	2.5	6.3
NW	0.50	0.80	1.00	0.30	0.00	0.00	2.6	6.1
NNW	0.40	1.10	1.80	0.30	0.00	0.00	3.6	6.2
CALM	0.00						0.00	
TOTAL	10.50	18.10	35.50	27.80	5.40	2.70	100.00	



FLORIDA CANYON MINE 1995 Wind Rose

APPENDIX C

PLANT SPECIES RECORDED AT THE FLORIDA CANYON MINE

Appendix C

Plant Species Recorded at the Florida Canyon Mine

TREES	
Russian olive	*Elaeagnus angustifolia*
Utah juniper	*Juniperus osteosperma*
plains cottonwood	*Populus deltoides* ssp. *wislizenii*
branch saltcedar	*Tamarix ramosissima*
SHRUBS	
iodine bush	*Allenrolfea occidentalis*
black sage	*Artemisia arbuscula* var. *nova*
budsage	*Artemisia spinescens*
big sagebrush	*Artemisia tridentata*
Wyoming big sagebrush	*Artemisia tridentata* ssp. *wyomingensis*
tall threetip sagebrush	*Artemisia tripartita*
four-wing saltbush	*Atriplex canescens*
shadscale	*Artiplex confertifolia*
brickellbush	*Brickellia* sp.
rubber rabbitbrush	*Chrysothamnus nauseosus*
sticky leaf rabbitbrush	*Chrysothamnus viscidiflorus*
red-ozier dogwood	*Cornus sericea*
Nevada ephedra	*Ephedra nevadensis*
goldenbrush	*Ericameria* sp.
mat buckwheat	*Eriogonum caespitosum*
Heermann buckwheat	*Eriogonum heermannii*
slenderbush buckwheat	*Eriogonum microthecum*
spiny hopsage	*Grayia spinosa*
broom snakeweed	*Gutierrezia sarothrae*
red sage	*Kochia americana*
winterfat	*Krascheninnikovia lanata*
desert almond	*Prunus fasciculata*
chokecherry	*Prunus virginiana*
gooseberry	*Ribes inerme* sp.

prickly currant	*Ribes lacustre*
desert gooseberry	*Ribes velutinum*
Wood's rose	*Rosa woodsii*
coyote willow	*Salix exigua*
sage	*Salvia dorrii*
elderberry	*Sambucus cerulea*
greasewood	*Sarcobatus vermiculatus*
smooth horsebrush	*Tetradymia glabrata*
spiny horsebrush	*Tetradymia spinosa*
GRASSES	
spike redtop	*Agrostis exarata*
cheatgrass	*Bromus tectorum*
sedge	*Carex* sp.
salt grass	*Distichlis spicata*
Basin wildrye	*Elymus cinereus*
bluebunch fescue	*Festuca idahoensis*
wiregrass	*Juncus balticus*
daggerleaf rush	*Juncus ensifolius*
Indian ricegrass	*Oryzopsis hymenoides*
littleseed canarygrass	*Phalaris minor*
fowl bluegrass	*Poa palustris*
Kentucky bluegrass	*Poa pratensis*
pine bluegrass	*Poa scabrella*
Sandberg bluegrass	*Poa secunda*
rabbitfoot grass	*Polypogon monspeliensis*
Nuttall's alkaligrass	*Puccinellia nuttalliana*
bulrush	*Scirpus* sp.
Bottlebrush squirreltail	*Sitanion hystrix*
longleaf squirreltail	*Sitanion longifolium*
needle-and-threadgrass	*Stipa comata*

Thurber needlegrass	*Stipa thurberiana*
six-weeks fescue	*Vulpia octoflora*
FORBS	
nettle leaf giant-hyssop	*Agastache urticifolia*
false-dandelion	*Agoseris* sp.
yellow alyssum	*Alyssum alyssoides*
redroot amaranth	*Amaranthus retroflexus*
tessellate fiddleneck	*Amsinckia tessellata*
purple funnel-lily	*Andorstephium breviflorum*
western red columbine	*Aquilegia elegantula*
crimson columbine	*Aquilegia formosa*
rockcress	*Arabis* sp.
hairy rockcress	*Arabis hirsuta*
narrow leaf milkweed	*Asclepias fascicularis*
milkvetch	*Astragalus* sp.
linearleaf milkvetch	*Astragalus linifolius*
Pursh milkvetch	*Astragalus purshii*
arrowleaf balsamroot	*Balsamorhiza sagittata*
four horn smotherweed	*Bassia hyssopifolia*
sego lily	*Calochortus nuttallii*
littlepod falseflax	*Camelina microcarpa*
clavate fruit primrose	*Camissonia claviformis*
Indian paintbrush	*Castilleja* sp.
thick stem wild cabbage	*Caulanthus crassicaulis*
Russian knapweed	*Centaurea repens*
Douglas false-yarrow	*Chaenactis douglassii*
lamb's quarter	*Chenopdium album*
narrowleaf goosefoot	*Chenopdium leptophyllum*
thistle	*Cirsium* sp.
western virgin's bower	*Clematis ligusticifolia*

tapertip hawksbeard	*Crepis acuminata*
dandelion hawksbeard	*Crepis runcinata*
catseye	*Cryptantha* sp.
pinnate tansy mustard	*Descurainia pinnata*
flixweed tansy mustard	*Descurainia sophia*
fleabane	*Erigeron* sp.
basin rayless fleabane	*Erigeron aphanactis*
annual buckwheat	*Eriogonum* sp.
Wyeth buckwheat	*Eriogonum heracleoides*
cushion buckwheat	*Eriogonum ovalifolium*
sulfur buckwheat	*Eriogonum umbellatum*
red stem filaree	*Erodium cicutarium*
spurge	*Euphorbia* sp.
purplespot friltillary	*Fritillaria atropurpurea*
bedstraw	*Galium bifolium*
Mohave gilia	*Gilia latifolia*
gumweed	*Grindelia squarrosa*
halogeton	*Halogeton glomerata*
stemless hymenoxys	*Hymenoxys acaulis*
poverty-weed	*Iva axillaris*
prickly lettuce	*Lactuca serriola*
broad leaf peppergrass	*Lepidium latifolium*
mountain peppergrass	*Lepidium montanum*
clasping peppergrass	*Lepidium perfoliatum*
lupine	*Lupinus* sp.
silvery lupine	*Lupinus argenteus*
tailcup lupine	*Lupinus caudatus*
skeleton plant	*Lygodesmia juncea*
tansy-aster	*Machaeranthera* sp.
whitestem eveningstar	*Mentzelia albicaulis*

Appendix C (Continued)

smoothstem eveningstar	*Mentzelia laevicaulis*
monkeyflower	*Mimulus guttatus*
coyote tobacco	*Nicotiana attenuata*
annual evening primrose	*Oenothera* sp.
tufted evening primrose	*Oenothera caespitosa*
Hooker evening primrose	*Oenothera hookeri*
sand cholla	*Opuntia pulchella*
broomrape	*Orobanche* sp.
locoweed	*Oxytropis* sp.
tufted locoweed	*Oxytropis multiceps*
lousewort	*Pedicularis* sp.
sand dune beardtongue	*Penstemon acuminatus*
scabland beardtongue	*Penstemon deustus*
scented beardtongue	*Penstemon palmeri*
scorpionweed	*Phacelia* sp.
moss phlox	*Phlox hoodii*
long leaf phlox	*Phlox longifolia*
river cinquefoil	*Potentilla rivalis*
curly dock	*Rumex crispus*
Russian thistle	*Salsola iberica*
desert figwort	*Scorphularia desertorum*
tumbling mustard	*Sisymbrium altissimum*
water parsnip	*Sium suave*
starry solomonplume	*Smilacina stellata*
annual sow thistle	*Sonchus oleraceus*
scarlet globemallow	*Sphaeralcea coccinea*
golden prince's plume	*Stanleya pinnata*
western seepweed	*Suaeda occidentalis*
yellow salsify	*Tragopogon dubius*
death camas	*Zigadenus venosus*

APPENDIX D

WILDLIFE SPECIES POTENTIALLY PRESENT IN THE VICINITY OF THE FLORIDA CANYON MINE

Appendix D

Wildlife Species Potentially Present in the Vicinity of the Florida Canyon Mine

MAMMALS	
Merriam's shrew	*Sorex merriami*
California myotis	*Myotis californicus*
small-footed myotis	*Myotis ciliolabrum*
long-eared myotis	*Myotis evotis*
little brown myotis	*Myotis lucifugus*
fringed myotis	*Myotis thysanodes*
cave myotis	*Myotis velifer*
long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
silver-haired bat	*Lasionycteris noctivagans*
western pipistrelle	*Pipistrellus hesperus*
big brown bat	*Eptesicus fuscus*
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*
pale Townsend's big-eared bat	*Corynorhinus towsendii pallescens*
spotted bat	*Euderma maculatum*
pallid bat	*Antrozous pallidus*
Mexican free-tailed bat	*Tadarida brasiliensis*
pygmy rabbit	*Brachylagus idahoensis*
mountain cottontail	*Sylvilagus nuttallii*
black-tailed jackrabbit	*Lepus californicus*
yellow-bellied marmot	*Marmota flaviventris*
white-tailed antelope squirrel	*Ammospermophilus leucurus*
Townsend's ground squirrel	*Spermophilus townsendii*
Townsend's pocket gopher	*Thomomys townsendii*
northern pocket gopher	*Thomomys talpoides*
little pocket mouse	*Perognathus longimembris*
Great Basin pocket mouse	*Perognathus parvus*

Appendix D (Continued)

dark kangaroo mouse	*Microdipodops megacephalus*
Ord's kangaroo rat	*Dipodomys ordii*
Great Basin kangaroo rat	*Dipodomys microps*
Merriam's kangaroo rat	*Dipodomys merriami*
western harvest mouse	*Reithrodontomys megalotis*
deer mouse	*Peromyscus maniculatus*
canyon mouse	*Peromyscus crinitus*
northern grasshopper mouse	*Onychomys leucogaster*
desert woodrat	*Neotoma lepida*
montane vole	*Microtus montanus*
long-tailed vole	*Microtus longicaudus*
sagebrush vole	*Lagurus curtatus*
coyote	*Canis latrans*
kit fox	*Vulpes macrotis*
badger	*Taxidea taxus*
long-tailed weasel	*Mustela frenata*
striped skunk	*Mephitis mephitis*
raccoon	*Procyon lotor*
mountain lion	*Felis concolor*
bobcat	*Lynx rufus*
western spotted skunk	*Spilogale gracilis*
mule deer	*Odocoileus hemionus*

REPTILES

zebra-tailed lizard	*Callisaurus draconoides*
common collared lizard	*Crotapahytus collaris*
black-collared lizard	*Crotaphytus insularis*
long-nosed leopard lizard	*Gambelia wislizenii*
desert spiny lizard	*Sceloporus magister*
western fence lizard	*Sceloporus occidentalis*

sagebrush lizard	*Sceloporus graciosus*
side-blotched lizard	*Uta stansburiana*
short-horned lizard	*Phrynosoma douglassi*
desert horned lizard	*Phrynosoma platyrhinos*
western whiptail lizard	*Cnemidophorus tigris*
western skink	*Eumeces skiltonianus*
striped whipsnake	*Masticophis taeniatus*
coachwhip	*Masticophis flagellum*
western patch-nosed snake	*Salvadora hexalepis*
gopher snake	*Pituophis melanoleucus*
common kingsnake	*Lampropeltis getulus*
long-nosed snake	*Rhinocheilus lecontei*
garter snake	*Thamnophis elegans*
night snake	*Hypsiglena torquata*
western rattlesnake	*Crotalus viridis*

BIRDS

least bittern	*Ixobrychus exilis hesperis*
white-faced ibis	*Pleqadis chihi*
black tern	*Chlidonias niger*
Swainson's hawk	*Buteo swainsoni*
red-tailed hawk	*Buteo jamaicensis*
ferruginous hawk	*Buteo regalis*
rough-legged hawk	*Buteo lagopus*
golden eagle	*Aquila chrysaetos*
bald eagle	*Haliaeetus leucocephalus*
turkey vulture	*Cathartes aura*
American kestrel	*Falco sparverius*
peregrine falcon	*Falco peregrinus anatum*
prairie falcon	*Falco mexicanus*

Appendix D (Continued)

northern goshawk	*Accipiter gentilis*
Cooper's hawk	*Accipiter cooperii*
sharp-shinned hawk	*Accipiter striatus*
northern harrier	*Circus cyaneus*
sage grouse	*Centrocercus urophasianus*
California quail	*Callipepla californica*
mountain quail	*Oreortyx pictus*
chukar	*Alectoris chukar*
killdeer	*Charadrius vociferus*
mourning dove	*Zenaida macroura*
great horned owl	*Bubo virginianus*
burrowing owl	*Athene cunicularia*
short-eared owl	*Asio flammeus*
common nighthawk	*Chordeiles minor*
common poorwill	*Phalaenoptilus nuttallii*
black-chinned hummingbird	*Archilochus alexandri*
gray flycatcher	*Empidonax wrightii*
Say's phoebe	*Sayornis saya*
western kingbird	*Tyrannus verticalis*
ash-throated flycatcher	*Myiarchus cinerascens*
horned lark	*Eremophila alpestris*
violet-green swallow	*Tachycineta thalassina*
cliff swallow	*Hirundo pyrrhonota*
barn swallow	*Hirundo rustica*
white-throated swift	*Aeronautes saxatalis*
black-billed magpie	*Pica pica*
common raven	*Corvus corax*
rock wren	*Salpinctes obsoletus*
mountain bluebird	*Sialia currucoides*
western bluebird	*Sialia mexicana*

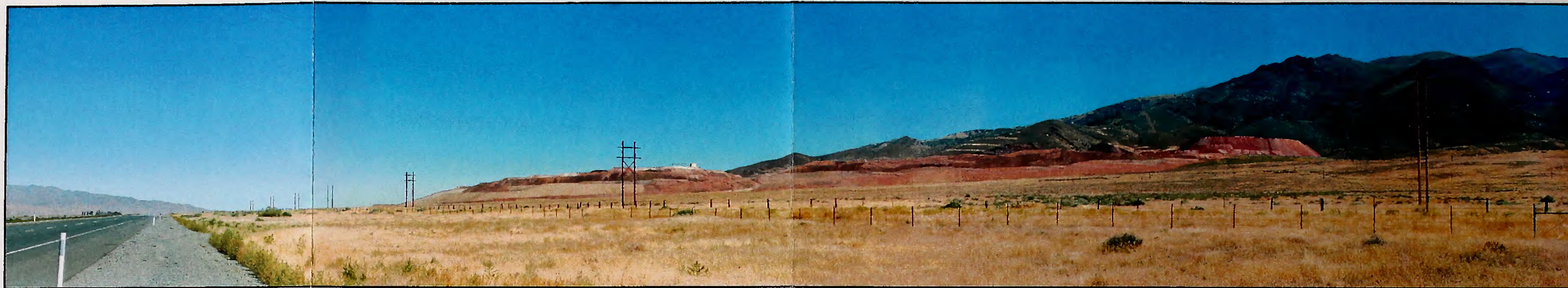
Appendix D (Continued)

Townsend's solitaire	*Myadestes townsendi*
American robin	*Turdus migratorius*
cedar waxwing	*Bombycilla cedrorum*
loggerhead shrike	*Lanius ludovicianus*
sage thrasher	*Oreoscoptes montanus*
European starling	*Sturnus vulgaris*
black-throated gray warbler	*Dendroica nigrescens*
warbling vireo	*Vireo gilvus*
lazuli bunting	*Passerina amoena*
northern oriole	*Icterus galbula*
green-tailed towhee	*Pipilo chlorurus*
spotted towhee	*Pipilo erythrophthalmus*
Brewer's sparrow	*Spizella breweri*
American tree sparrow	*Spizella arborea*
vesper sparrow	*Pooecetes gramineus*
lark sparrow	*Chondestes grammacus*
chipping sparrow	*Spizella passerina*
savannah sparrow	*Passerculus sandwichensis*
grasshopper sparrow	*Ammodramus savannarum*
black-throated sparrow	*Amphispiza bilineata*
sage sparrow	*Amphispiza belli*
Lapland longspur	*Calcarius lapponicus*
western meadowlark	*Sturnella neglecta*
Brewer's blackbird	*Euphagus cyanocephalus*
blue-gray gnatcatcher	*Polioptila caerulea*
bushtit	*Psaltriparus minimus*
northern flicker	*Colaptes auratus*
western tanager	*Piranga ludoviciana*
house sparrow	*Passer domesticus*
American goldfinch	*Carduelis tristis*
house finch	*Carpodacus mexicanus*

APPENDIX E

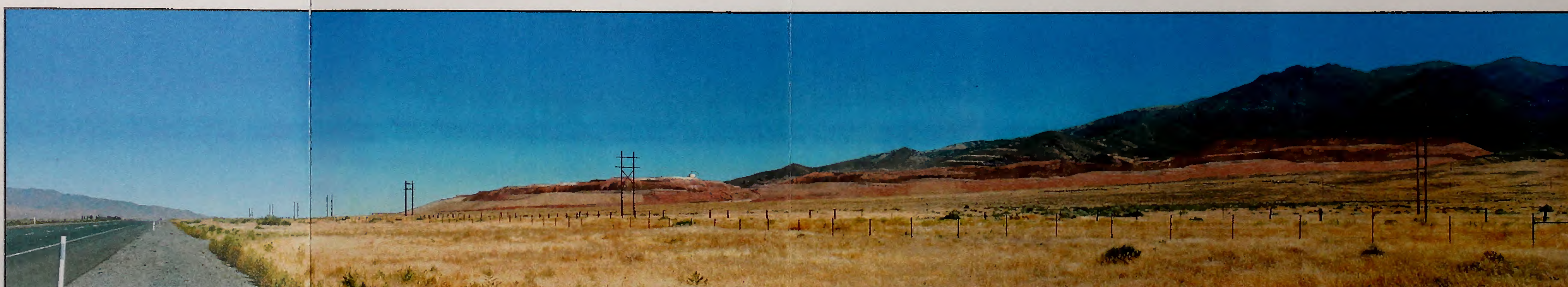
VISUAL SIMULATION AND BLM VISUAL CONTRAST RATING WORKSHEETS

KOP #1 - MILEPOST 136 ON I-80



End of 1997 - No Action Alternative

Maximum Potential Visual Contrast - Proposed Action



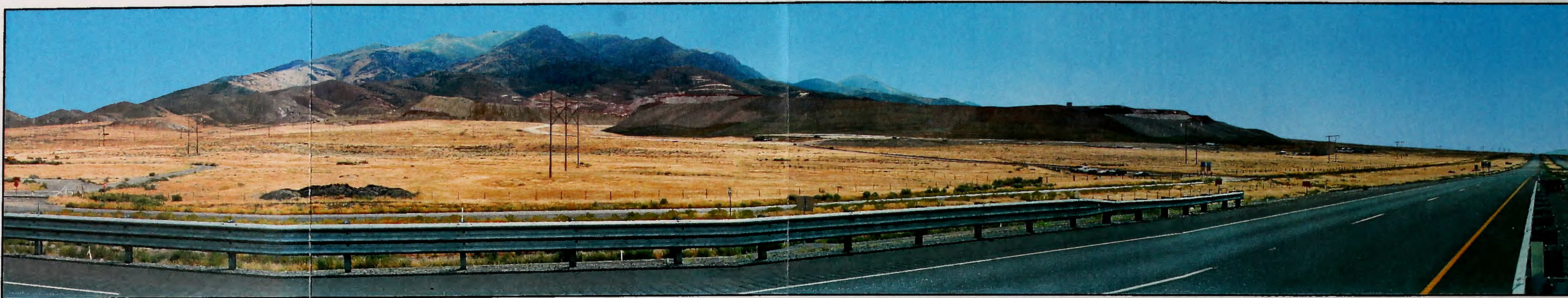
Maximum Potential Visual Contrast - North Heap Leach Pad Alternative

10 Years After Reclamation - No Action Alternative

10 Years After Reclamation - Proposed Action

10 Years After Reclamation - North Heap Leach Pad Alternative

KOP #1 - MILEPOST 136 ON I-80



End of 1997 - No Action Alternative

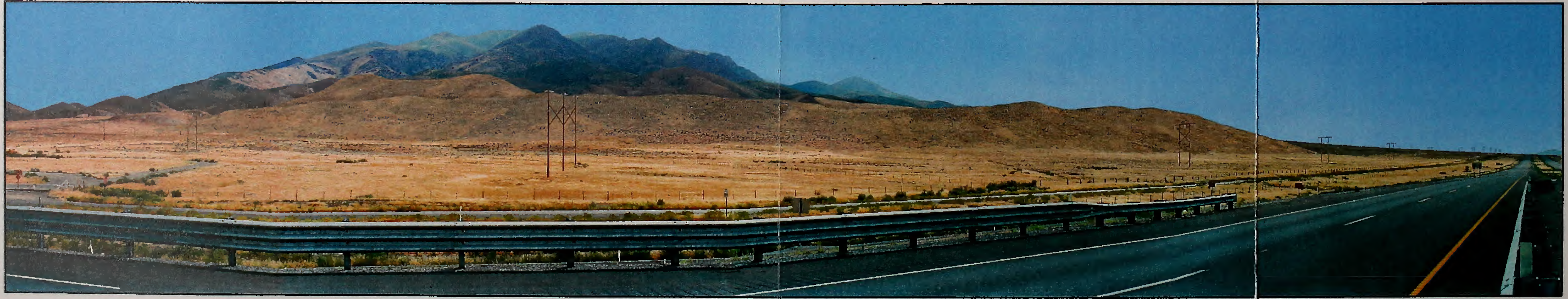
Maximum Potential Visual Contrast - Proposed Action

Maximum Potential Visual Contrast - North Heap Leach Pad Alternative

KOP #2 - MILEPOST 138 (HUMBOLDT EXIT), ON I-80

10 Years After Reclamation - No Action Alternative

10 Years After Reclamation - Proposed Action



10 Years After Reclamation - North Heap Leach Pad Alternative

KOP #3 - MILEPOST 139.5 ON I-80

End of 1997 - No Action Alternative

Maximum Potential Visual Contrast - Proposed Action

Maximum Potential Visual Contrast - North Heap Leach Pad Alternative

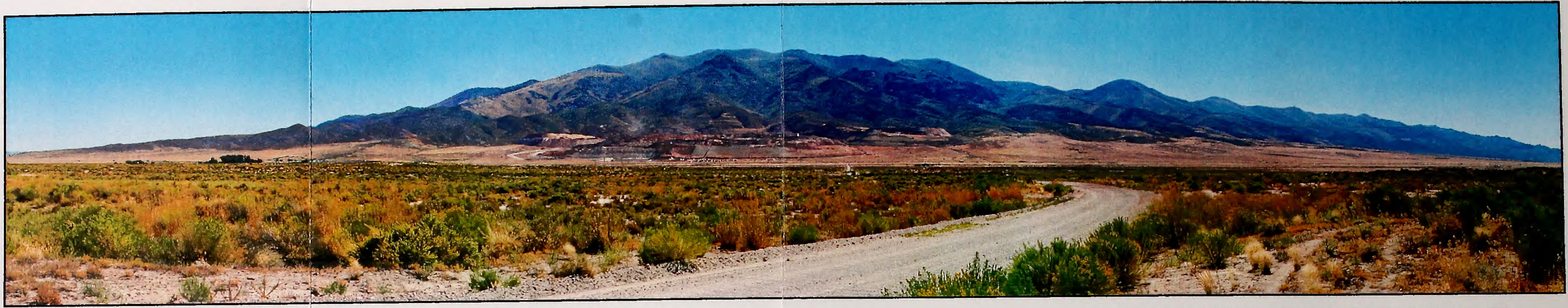
KOP #3 - MILEPOST 139.5 ON I-80

10 Years After Reclamation - No Action Alternative

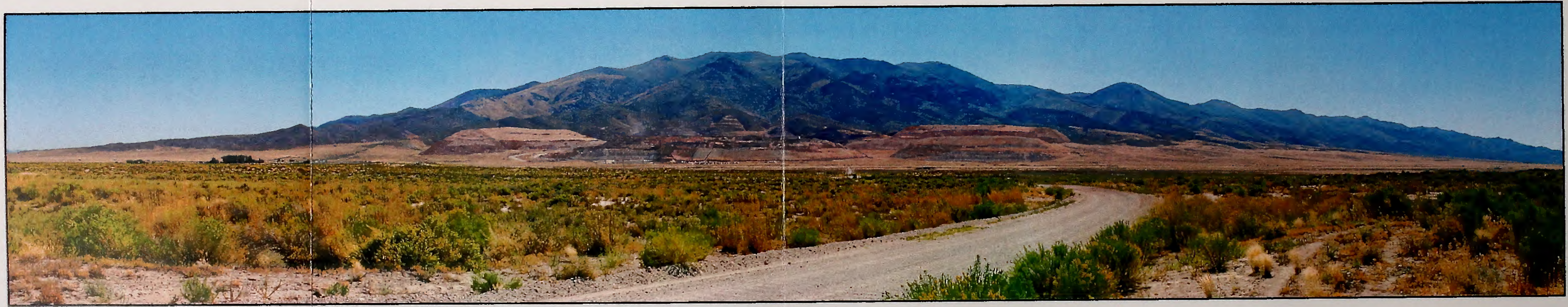
10 Years After Reclamation - Proposed Action

10 Years After Reclamation - North Heap Leach Pad Alternative

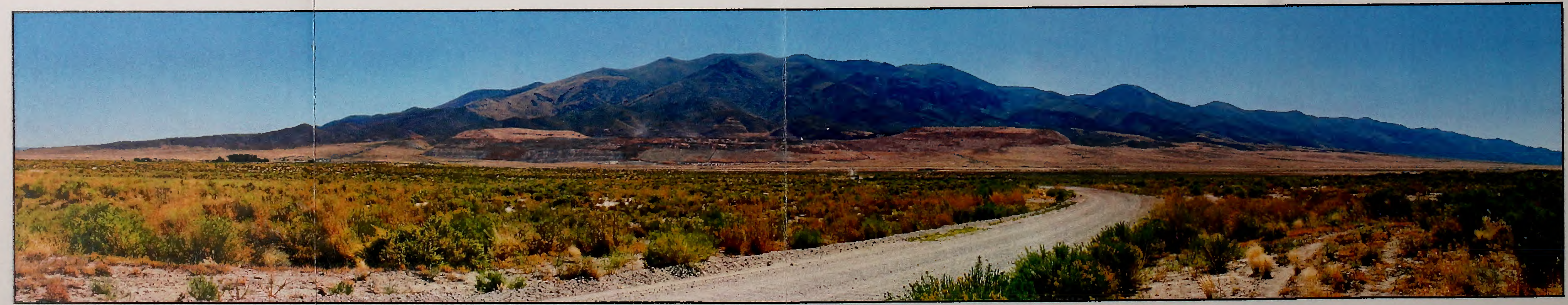
KOP #4 - PITT-TAYLOR DAM / RESERVOIR



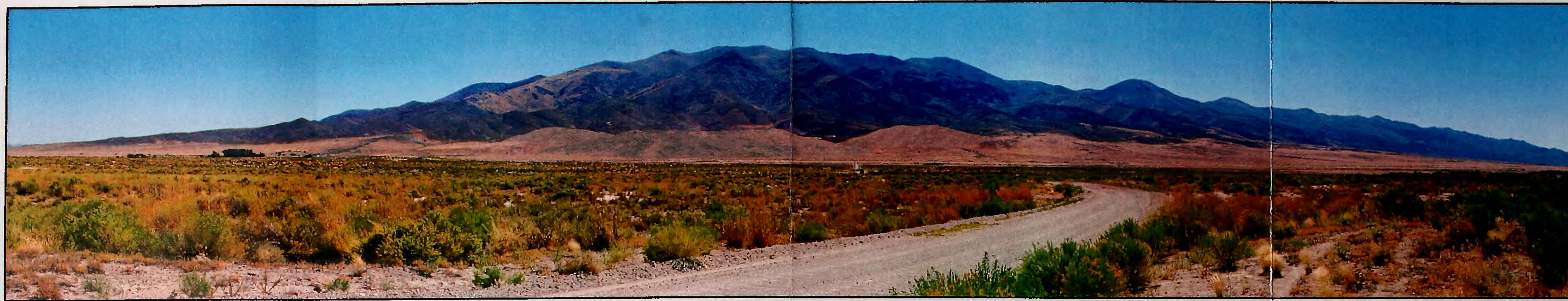
End of 1997 - No Action Alternative



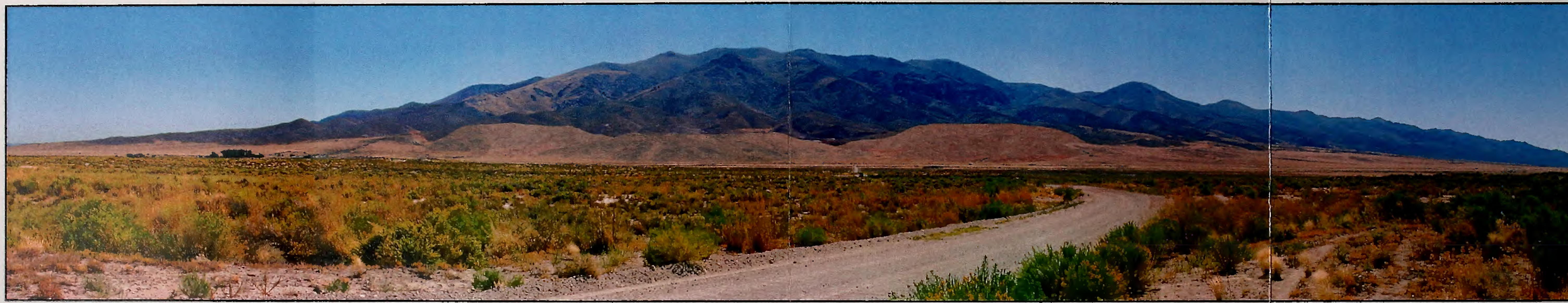
Maximum Potential Visual Contrast - Proposed Action



Maximum Potential Visual Contrast - North Heap Leach Pad Alternative



10 Years After Reclamation - No Action Alternative



10 Years After Reclamation - Proposed Action

10 Years After Reclamation - North Heap Leach Pad Alternative

KOP #4 - PITT-TAYLOR DAM / RESERVOIR

BLM Visual Contrast Rating Work Sheets

The following BLM Visual Contrast Rating Worksheets were used to described the characteristic (existing) landscape and Proposed Activities as viewed from each key observation point. Descriptions of the characteristic landscape are summarized for major elements within foreground (F), middleground (M), and background (B) viewing zones. No entry is made for foreground and background viewing zones for descriptions of Proposed Activities since the project area occurs mostly within the middleground (M) viewing zone of each key observation point; changes to elements within the foreground and background would not occur. Separate contrast ratings for the Proposed Activities are given for the Proposed Action and the North Leach Pad Alternative at end of mining as this scenario represents the maximum visual contrast. Contrast ratings for these alternatives are then given for the 10 years after reclamation scenario in order to demonstrate how proposed reclamation is expected to reduce visual contrasts over time. The waste rock dump(s) and leach pad for each alternative were considered to be *landforms* for the purposes of this contrast rating.

North Heap Leach Pad Alternative - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS
2. Key Observation Point #1 (Milepost 136)
3. VRM Class II

4. Location
Township 31N
Range 33E
Section 9

5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: rhomboid & trapezoid B: tall & rolling to rugged	F: regular & small patchy M: strip (where present) B: irregular & patchy	F: linear & parallel, rectangular M: short & cylindrical B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: rugged, diagonal & curving	F: indistinct M: horizontal & straight B: straight & diagonal to rounded	F: straight & vertical M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: light brown, reddish brown, white B: beige (where present)	F: beige, grey-green M: beige (where present) B: medium to dark olive	F: brown M: white B: none
Texture	F: smooth M: smooth to medium B: coarse	F: smooth to moderate M: smooth B: medium & gradation	F: sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: rhomboid & trapezoid	M: strip	M: short cylindrical
Line	M: parallel & horizontal, diagonal	M: horizontal & straight	M: flat & rounded
Color	M: light brown, reddish brown, white	M: beige (where present)	M: white
Texture	M: smooth to medium	M: smooth	M: smooth to medium

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST

	FEATURES											
	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
Elements	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			✓					✓				✓
Line			✓					✓				✓
Color			✓					✓				✓
Texture			✓					✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names Date
R. Rasmussen

Proposed Action - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-10-97

District Winnemucca

Resource Area

Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #1 (Milepost 136)
3. **VRM Class** II
4. **Location**
   Township 31N
   Range 33E
   Section 9
5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: rhomboid & trapezoid B: tall & rolling to rugged	F: regular & small patchy M: strip (where present) B: irregular & patchy	F: linear & parallel, rectangular M: short & cylindrical B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: rugged, diagonal & curving	F: indistinct M: horizontal & straight B: straight & diagonal to rounded	F: straight & vertical M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: light brown, reddish brown, while B: beige (where present)	F: beige, grey-green M: beige (where present) B: medium to dark olive	F: brown M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to moderate M: smooth B: medium & gradation	F: sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: prominent, elongated rhomboid	M: elongated & rectangular	M: none
Line	M: bold, flat, & horizontal, stepped	M: horizontal & straight to curving	M: none
Color	M: light brown, reddish brown, white	M: beige (where present)	M: none
Tex-ture	M: smooth	M: smooth	M: none

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST — FEATURES

Elements	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form		✓					✓					✓
Line		✓					✓					✓
Color			✓					✓				✓
Texture			✓				✓					✓

2. Does project design meet visual resource management objectives?
   ☐ Yes ☑ No

3. Additional mitigating measures recommended
   ☐ Yes ☑ No

Evaluator's Names: R. Rasmussen

Date

North Heap Leach Pad Alternative - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS	4. Location Township 31N Range 33E Section 9	5. Location Sketch
2. Key Observation Point #1 (Milepost 136)		
3. VRM Class II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: rhomboid & trapezoid B: tall & rolling to rugged	F: regular & small patchy M: strip (where present) B: irregular & patchy	F: linear & parallel, rectangular M: short & cylindrical B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: rugged, diagonal & curving	F: indistinct M: horizontal & straight B: straight & diagonal to rounded	F: straight & vertical M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: light brown, reddish brown, white B: beige (where present)	F: beige, grey-green M: beige (where present) B: medium to dark olive	F: brown M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to moderate M: smooth B: medium & gradation	F: sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: rhomboids w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, diagonal & curving	M: indistinct	M: none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth to medium	M: smooth & granular	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST — FEATURES

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form			✓				✓					✓
Line			✓				✓					✓
Color				✓				✓				✓
Texture			✓				✓					✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names Date
R. Rasmussen

Proposed Action - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97

District Winnemucca

Resource Area

Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS	4. Location	5. Location Sketch
2. Key Observation Point #1 (Milepost 136)	Township 31N Range 33E Section 9	
3. VRM Class II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: rhomboid & trapezoid B: tall & rolling to rugged	F: regular & small patchy M: strip (where present) B: irregular & patchy	F: linear & parallel, rectangular M: short & cylindrical B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: rugged, diagonal & curving	F: indistinct M: horizontal & straight B: straight & diagonal to rounded	F: straight & vertical M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: light brown, reddish brown, white B: beige (where present)	F: beige, grey-green M: beige (where present) B: medium to dark olive	F: brown M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to moderate M: smooth B: medium & gradation	F: sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: elongated rhomboid w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, diagonal & curving	M:indistinct	M:none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth	M: smooth & granular	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form			✓				✓					✓
Line			✓				✓					✓
Color				✓				✓				✓
Texture				✓			✓					✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names	Date
R. Rasmussen	

North Heap Leach Pad Alternative - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97

District Winnemucca

Resource Area

Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS	4. Location Township 32N Range 33E Section 34	5. Location Sketch
2. Key Observation Point #2 (Milepost 138)		
3. VRM Class II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: prominent, elongated rhomboids B: tall, rolling & pyramidal	F: regular M: strip (where present) B: irregular patchy	F: geometric, rectangular, linear M: short & cylindrical B: none
Line	F: straight & horizontal M: parallel & horizontal, diagonal B: jaggedly horizontal, diagonal & straight	F: parallel & vertical & slightly curved M: curving, parallel, & converging B: none	F: parallel & vertical & slightly curved M: curving, parallel & converging B: none
Color	F: light gray (where visible) M: tan, orange brown, light brown B: tan (where visible)	F: beige, light green, brown M: beige & medium olive B: medium to dark olive	F: grey, tan, brown M: white, tan B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth M: smooth B: medium & gradation	F: smooth to sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: prominent, flattened & stacked rhomboids	M: strip (where present)	M: short & cylindrical
Line	M: bold, flat & horizontal; diagonal	M: horizontal & parallel	M: straight, parallel & converging
Color	M: orange brown, light brown, dark grey, white	M: beige & medium olive	M: white, tan
Tex-ture	M: smooth to medium	M: smooth & granular	M: smooth to medium

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST

FEATURES

Elements	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			✓					✓				✓
Line			✓					✓			✓	
Color			✓					✓				✓
Texture				✓			✓					✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names — Date

R. Rasmussen

Proposed Action - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS
2. Key Observation Point #2 (Milepost 138)
3. VRM Class II

4. Location
Township 32N
Range 33E
Section 34

5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: prominent, elongated rhomboids B: tall, rolling & pyramidal	F: regular M: strip (where present) B: irregular patchy	F: geometric, rectangular, linear M: short & cylindrical B: none
Line	F: straight & horizontal M: parallel & horizontal, diagonal B: jaggedly horizontal, diagonal & straight	F: indistinct to horizontal & diffuse M: horizontal & parallel B: curving & irregular	F: parallel & vertical & slightly curved M: curving, parallel & converging B: none
Color	F: light gray (where visible) M: tan, orange brown, light brown B: tan (where visible)	F: beige, light green, brown M: beige & medium olive B: medium to dark olive	F: grey, tan, brown M: white, tan B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth M: smooth B: medium & gradation	F: smooth to sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: prominent, elongated & stacked rhomboids	M: strip (where present)	M: short & cylindrical
Line	M: parallel, bold & horizontal; diagonal	M: horizontal & parallel	M: straight to curving, parallel & converging
Color	M: tan, orange brown, light brown, grey, white	M: beige	M: white, tan
Tex-ture	M: smooth to coarse	M: smooth	M: smooth to medium

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		✓					✓					✓
Line		✓					✓					✓
Color			✓					✓				✓
Texture		✓						✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names: R. Rasmussen
Date

North Heap Leach Pad Alternative - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS
2. Key Observation Point #2 (Milepost 138)
3. VRM Class II

4. Location
Township 32N
Range 33E
Section 34

5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: prominent, elongated rhomboids B: tall, rolling & pyramidal	F: regular M: strip (where present) B: irregular patchy	F: geometric, rectangular, linear M: short & cylindrical B: none
Line	F: straight & horizontal M: parallel & horizontal, diagonal B: jaggedly horizontal, diagonal & straight	F: parallel & vertical & slightly curved M: curving, parallel, & converging B: none	F: parallel & vertical & slightly curved M: curving, parallel & converging B: none
Color	F: light gray (where visible) M: tan, orange brown, light brown B: tan (where visible)	F: beige, light green, brown M: beige & medium olive B: medium to dark olive	F: grey, tan, brown M: white, tan B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth M: smooth B: medium & gradation	F: smooth to sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: elongated rhomboids w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, curving, diagonal	M: indistinct	M: none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth	M: smooth & granular	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

Elements	Land/Water Body (1) Strong	Moderate	Weak	None	Vegetation (2) Strong	Moderate	Weak	None	Structures (3) Strong	Moderate	Weak	None
Form			✓				✓					✓
Line			✓					✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names: R. Rasmussen
Date

Proposed Action - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #2 (Milepost 138)
3. **VRM Class** II

4. **Location**
Township 32N
Range 33E
Section 34

5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: prominent, elongated rhomboids B: tall, rolling & pyramidal	F: regular M: strip (where present) B: irregular patchy	F: geometric, rectangular, linear M: short & cylindrical B: none
Line	F: straight & horizontal M: parallel & horizontal, diagonal B: jaggedly horizontal, diagonal & straight	F: parallel & vertical & slightly curved M: curving, parallel, & converging B: none	F: parallel & vertical & slightly curved M: curving, parallel & converging B: none
Color	F: light gray (where visible) M: tan, orange brown, light brown B: tan (where visible)	F: beige, light green, brown M: beige & medium olive B: medium to dark olive	F: grey, tan, brown M: white, tan B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth M: smooth B: medium & gradation	F: smooth to sharp M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: elongated rhomboids w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, curving, diagonal	M: indistinct	M: none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth	M: smooth & granular	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form			✓				✓					✓
Line			✓					✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives? ☑ Yes ☐ No

3. Additional mitigating measures recommended ☐ Yes ☑ No

Evaluator's Names	Date
R. Rasmussen	

North Heap Leach Pad Alternative - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97

District Winnemucca

Resource Area

Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS
2. Key Observation Point #3 (Milepost 139.5)
3. VRM Class II

4. Location
Township 32N
Range 33E
Section 26

5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flattened rhomboids B: tall, rugged & pyramidal	F: regular & strip M: strip (where present) B: irregular & patchy	F: rectangular M: short & cylindrical, linear B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: jaggedly horizontal	F: indistinct to horizontal & converging M: horizontal & straight B: irregular	F: straight M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: tan, orange brown, light brown, white B: tan & dark brown	F: muted yellow, beige, medium olive M: beige (where present) B: dark olive & brown	F: green & blue M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to medium M: smooth B: medium	F: coarse M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flattened, elongated rhomboid	M: strip (where present)	M: short & cylindrical, linear
Line	M: parallel & horizontal, diagonal	M: horizontal & straight	M: flat & geometric
Color	M: tan, orange brown, light brown, white	M: beige (where present)	M: white
Tex-ture	M: smooth to medium	M: smooth	M: smooth to medium

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST — FEATURES

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form			✓					✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names — Date

R. Rasmussen

Proposed Action - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-11-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. Project Name Florida Canyon Mine Expansion EIS
2. Key Observation Point #3 (Milepost 139.5)
3. VRM Class II
4. Location
Township 32N
Range 33E
Section 26
5. Location Sketch

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flattened rhomboids B: tall, rugged & pyramidal	F: regular & strip M: strip (where present) B: irregular & patchy	F: rectangular M: short & cylindrical, linear B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: jaggedly horizontal	F: indistinct to horizontal & converging M: horizontal & straight B: irregular	F: straight M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: tan, orange brown, light brown, white B: tan & dark brown	F: muted yellow, beige, medium olive M: beige (where present) B: dark olive & brown	F: green & blue M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to medium M: smooth B: medium	F: coarse M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flattened, elongated rhomboid	M: strip (where present)	M: short & cylindrical, linear
Line	M: parallel & horizontal, diagonal	M: horizontal & straight	M: flat & geometric
Color	M: tan, orange brown, light brown, white	M: beige (where present)	M: white
Tex-ture	M: smooth to medium	M: smooth	M: smooth to medium

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST

	FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
Elements	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			✓					✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives? ☑ Yes ☐ No

3. Additional mitigating measures recommended ☐ Yes ☑ No

Evaluator's Names: R. Rasmussen
Date

North Heap Leach Pad Alternative - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97

District Winnemucca

Resource Area

Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS	4. **Location** Township 32N Range 33E Section 26	5. **Location Sketch**
2. **Key Observation Point** #3 (Milepost 139.5)		
3. **VRM Class** II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flattened rhomboids B: tall, rugged & pyramidal	F: regular & strip M: strip (where present) B: irregular & patchy	F: rectangular M: short & cylindrical, linear B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: jaggedly horizontal	F: indistinct to horizontal & converging M: horizontal & straight B: irregular	F: straight M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: tan, orange brown, light brown, white B: tan & dark brown	F: muted yellow, beige, medium olive M: beige (where present) B: dark olive & brown	F: green & blue M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to medium M: smooth B: medium	F: coarse M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flattened rhomboid w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, diagonal & curving	M: indistinct	M: none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth	M: smooth	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
Elements	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			✓				✓					✓
Line			✓					✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names | Date

R. Rasmussen

Proposed Action - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #3 (Milepost 139.5)
3. **VRM Class** II

4. **Location**
Township 32N
Range 33E
Section 26

5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flattened rhomboids B: tall, rugged & pyramidal	F: regular & strip M: strip (where present) B: irregular & patchy	F: rectangular M: short & cylindrical, linear B: none
Line	F: straight & sloping M: parallel & horizontal, diagonal B: jaggedly horizontal	F: indistinct to horizontal & converging M: horizontal & straight B: irregular	F: straight M: flat & geometric B: none
Color	F: indistinct (covered w/ vegetation) M: tan, orange brown, light brown, white B: tan & dark brown	F: muted yellow, beige, medium olive M: beige (where present) B: dark olive & brown	F: green & blue M: white B: none
Tex-ture	F: smooth M: smooth to medium B: coarse	F: smooth to medium M: smooth B: medium	F: coarse M: smooth to medium B: none

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flattened rhomboids w/ irregular edges	M: regular/indistinct	M: none
Line	M: horizontal & undulating, diagonal & curving	M: indistinct	M: none
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: none
Tex-ture	M: smooth	M: smooth	M: none

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form			✓				✓					✓
	Line			✓					✓				✓
	Color				✓				✓				✓
	Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
☑ Yes ☐ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names	Date
R. Rasmussen	

North Heap Leach Pad Alterantive - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS	4. **Location**	5. **Location Sketch**
2. **Key Observation Point** #4 (Pitt-Taylor)	**Township** 32N **Range** 33E **Section** 32	
3. **VRM Class** II		

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flat & sloping to flattened trapezoids B: tall, rolling & pyramidal	F: regular M: regular to strip B: irregular & patchy	F: wide & curving M: numerous, small, linear B: none
Line	F: flat & horizontal M: straight to rounded & irregular B: rolling & horizontal, diagonal & curving	F: horizontal & straight M: horizontal & diagonal & straight B: diagonal & straight, rounded & irregular	F: curving & converging M: indistinct B: none
Color	F: light grey (where visible) M: beige, light brown, reddish brown B: beige (where visible)	F: muted yellow, light green, beige M: beige, medium olive, light grey B: medium olive & dark olive	F: light grey M: white, tan B: none
Tex-ture	F: smooth M: smooth to coarse B: coarse	F: smooth to coarse M: smooth B: smooth & granular	F: smooth M: smooth B: smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flat & sloping, flattened trapezoid, prominent trapezoids	M: strip	M: numerous, small, linear
Line	M: straight, horizontal & diagonal; to rounded & irregular	M: horizontal & diagonal & straight	M: indistinct
Color	M: beige, light brown, reddish brown, medium grey	M: beige, medium olive, light grey	M: white, tan
Tex-ture	M: smooth to coarse	M: smooth	M: smooth

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST

Elements	LAND/WATER BODY (1) Strong	Moderate	Weak	None	VEGETATION (2) Strong	Moderate	Weak	None	STRUCTURES (3) Strong	Moderate	Weak	None
Form		✓						✓				✓
Line		✓						✓				✓
Color			✓					✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
☐ Yes ☑ No

3. Additional mitigating measures recommended
☐ Yes ☑ No

Evaluator's Names: R. Rasmussen
Date

Proposed Action - End of Mining

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #4 (Pitt-Taylor)
3. **VRM Class** II

4. **Location**
Township 32N
Range 33E
Section 32

5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flat & sloping to flattened trapezoids B: tall, rolling & pyramidal	F: regular M: regular to strip B: irregular & patchy	F: wide & curving M: numerous, small, linear B: none
Line	F: flat & horizontal M: straight to rounded & irregular B: rolling & horizontal, diagonal & curving	F: horizontal & straight M: horizontal & diagonal & straight B: diagonal & straight, rounded & irregular	F: curving & converging M: indistinct B: none
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Tex-ture	F: smooth M: smooth to coarse B: coarse	F: smooth to coarse M: smooth B: smooth & granular	F: smooth M: smooth B: smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flat & sloping, flattened trapezoid, prominent trapezoids	M: strip	M: numerous, small, linear
Line	M: straight, horizontal & diagonal; to rounded & irregular	M: horizontal & diagonal & straight	M: indistinct
Color	M: beige, light brown, reddish brown, medium grey	M: beige, medium olive, light grey	M: white, tan
Tex-ture	M: smooth to coarse	M: smooth	M: smooth

SECTION D. CONTRAST RATING ☑ SHORT TERM ☐ LONG TERM

1. DEGREE OF CONTRAST		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Elements	Form		✓						✓				✓
	Line		✓						✓				✓
	Color			✓					✓				✓
	Texture				✓				✓				✓

2. Does project design meet visual resource management objectives? ☐ Yes ☑ No

3. Additional mitigating measures recommended ☐ Yes ☑ No

Evaluator's Names — Date
R. Rasmussen

North Heap Leach Pad Alternative - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #4 (Pitt-Taylor)
3. **VRM Class** II

4. **Location**
Township 32N
Range 33E
Section 32

5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flat & sloping to flattened trapezoids B: tall, rolling & pyramidal	F: regular M: regular to strip B: irregular & patchy	F: wide & curving M: numerous, small, linear B: none
Line	F: flat & horizontal M: straight to rounded & irregular B: rolling & horizontal, diagonal & curving	F: horizontal & straight M: horizontal & diagonal & straight B: diagonal & straight, rounded & irregular	F: curving & converging M: indistinct B: none
Color	F: light grey (where visible) M: beige, light brown, reddish brown B: beige (where visible)	F: muted yellow, light green, beige M: beige, medium olive, light grey B: medium olive & dark olive	F: light grey M: white, tan B: none
Texture	F: smooth M: smooth to coarse B: coarse	F: smooth to coarse M: smooth B: smooth & granular	F: smooth M: smooth B: smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flat & sloping to trapezoids w/ irregular & curving edges	M: regular/indistinct	M: indistinct
Line	M: rounded to horizontal & undulating, diagonal & curving	M: indistinct	M: indistinct
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: indistinct
Texture	M: smooth to coarse	M: smooth	M: indistinct

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST — FEATURES

Elements	Land/Water Body (1) Strong	Moderate	Weak	None	Vegetation (2) Strong	Moderate	Weak	None	Structures (3) Strong	Moderate	Weak	None
Form			✓					✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives? ☑ Yes ☐ No

3. Additional mitigating measures recommended ☐ Yes ☑ No

Evaluator's Names: R. Rasmussen
Date

Proposed Action - 10 Years After Reclamation

Form 8400-4
(September 1985)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

VISUAL CONTRAST RATING WORKSHEET

Date 3-12-97
District Winnemucca
Resource Area
Activity (program) Mine Expansion

SECTION A. PROJECT INFORMATION

1. **Project Name** Florida Canyon Mine Expansion EIS
2. **Key Observation Point** #4 (Pitt-Taylor)
3. **VRM Class** II
4. **Location**
   Township 32N
   Range 33E
   Section 32
5. **Location Sketch**

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION (End of 1997)

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	F: flat/indistinct M: flat & sloping to flattened trapezoids B: tall, rolling & pyramidal	F: regular M: regular to strip B: irregular & patchy	F: wide & curving M: numerous, small, linear B: none
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Color	F: light grey (where visible) M: beige, light brown, reddish brown B: beige (where visible)	F: muted yellow, light green, beige M: beige, medium olive, light grey B: medium olive & dark olive	F: light grey M: white, tan B: none
Tex-ture	F: smooth M: smooth to coarse B: coarse	F: smooth to coarse M: smooth B: smooth & granular	F: smooth M: smooth B: smooth

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
Form	M: flat & sloping to trapezoids w/ irregular & curving edges	M: regular/indistinct	M: indistinct
Line	M: rounded to horizontal & undulating, diagonal & curving	M: indistinct	M: indistinct
Color	M: indistinct (covered w/ vegetation)	M: beige & medium olive	M: indistinct
Tex-ture	M: smooth to coarse	M: smooth	M: indistinct

SECTION D. CONTRAST RATING ☐ SHORT TERM ☑ LONG TERM

1. DEGREE OF CONTRAST

Elements	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			✓					✓				✓
Line				✓				✓				✓
Color				✓				✓				✓
Texture				✓				✓				✓

2. Does project design meet visual resource management objectives?
   ☑ Yes ☐ No

3. Additional mitigating measures recommended
   ☐ Yes ☑ No

Evaluator's Names — Date

R. Rasmussen

APPENDIX F

CULTURAL RESOURCES SIGNIFICANCE CRITERIA

APPENDIX F

CULTURAL RESOURCES SIGNIFICANCE CRITERIA

The significance of a cultural heritage resource is an assessment of its importance to the citizens of the United States and indicates whether a site has attributes that qualify it for inclusion on the NRHP. In order to be considered eligible for the NRHP, a cultural resource must be a district, site, building, structure, or object that retains its integrity of location, design, setting, materials, workmanship, feeling, and association, and satisfies at least one of the four significance criteria defined in 36 CFR part 60.4. These criteria include:

- Part 60.4a - sites that are associated with events that have made a significant contribution to the broad patterns of history;
- Part 60.4b - sites that are associated with the lives of persons significant in our past;
- Part 60.4c - sites that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
- Part 60.4d - sites that have yielded, or may be likely to yield, important information on prehistory or history (Parker and King no date).

Cultural heritage sites also are considered significant if they are protected under other state or Federal statutes, such as the Native American Graves Protection and Repatriation Act or the Nevada Indian Burial Protection Act (Nevada Regulations Statutes 383.150), which outlines procedures regarding treatment of human burials on state or privately-owned land in Nevada.

An undertaking has an effect on a cultural property if it alters any of the characteristics or criteria that may qualify the property for inclusion on the NRHP or otherwise affects a property's legally protected status. Impacts to cultural heritage resources are considered adverse if the effect diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects can include, but are not limited to:

- Direct physical disturbance, damage, or alteration of all or part of a site or property that is listed on or is eligible for the NRHP, or is protected under state and/or other Federal statutes;
- Isolation of the property from or alteration of the character of the property's setting;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- Neglect of a property resulting in its deterioration or destruction; and
- Transfer, lease, or sale of the property (36 CFR, 800.9, revised as of July 1, 1994).

Discussions of project impacts are limited to sites within the proposed mine area deemed to be significant or eligible for inclusion on the NRHP or sites that have Federal and/or state protection under other statutes.

Effects of an undertaking that have been found to be adverse as described above may be considered not adverse when:

- The property is of value only for its potential contribution to archeological, historical, or architectural research, and when that value can be preserved through appropriate research conducted in accordance with applicable professional standards and guidelines. This applies only to those sites identified as eligible to the Register under Criterion "D" and mitigated under treatment plans approved by the applicable agencies.
- The undertaking is limited to rehabilitation of structures that preserves the historical and architectural value to the property, and when transfer, sale, or lease includes restrictions or conditions that ensure the preservation of the property's significant features (36 CFR 800.9 (c)(1-3).

Sites eligible to the Register under Criteria A, B, and C that may experience adverse effects from the undertaking can sometimes be mitigated through such methods as development of educational centers or kiosks that provide information on the affected properties. Mitigation for sites nominated under Criteria A, B, and/or C that would experience adverse effects must be developed and defined in a treatment plan approved by the appropriate agencies.